

approach

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OCTOBER 1965 THE NAVAL AVIATION SAFETY REVIEW



HILLS,
HEIGHTS
& HELOS



By MAJ R.A. Bonney, USMC

Let's say you're a helicopter pilot. If it's a normal day you haven't been thinking much about things that happen above 1500 ft MSL. Then comes a message: A helo trip to the mountains is requested. Well, you're a helo pilot w/helo, so you go—but only after a bit of planning. First, do some thinking in a high level vein.

For all its talent, the helo is comparatively fragile in certain situations, such as high altitude maneuvering and rough area landings (RAL) at mountain sites. At altitude it is not the same aircraft, as many well-qualified "sea level" pilots have found.

Your primary job is to calculate if the helicopter is capable of completing the task. Consider the load: What kind and how much?

Then, what about the destination? This involves more than just direction, and distance from home base. Preferential helo routes are seldom direct and generally twist around through valleys and passes for lowest enroute altitudes. Examine the charts for your route *before* climbing into the cockpit.

Evaluate the elevation of the destination. Wind and temperature are necessary for planning but if you have up-to-date information you are lucky. Without on-site data, use no wind and estimate temperature from time of year and time of day then add a few degrees for a cushion.

Terrain itself must be considered. Is the landing



site a wide, flat meadow or a skimpy ridge which gives you cheese parings and candle ends for a touchdown space?

When these elements are all taken into account, an uncomfortable situation may result. Here's why.

For getting a job done, a lot of people think in terms of a helo. The natural flexibility of the machine allows it to perform tasks with an apparent ease which makes other methods time-consuming or cumbersome by comparison. Consequently there is a temptation to assume the helo can do just about anything—and it can, within its operating envelope. As a helo pilot it might be your task to temper enthusiasm with cold facts on allowable payload versus altitude or fuel weight required.

Also, you must be suspicious of a landing site that the ground party has picked out until you have seen it yourself and can judge it as adequate. Enthusiasm for the helicopter's abilities gives people the tendency to overestimate its capabilities. For example, the site may appear satisfactory from the ground but be unsafe for the pilot because there is no waveoff "escape or abort route."

It is true that a helo pilot can be diverted from a low altitude flight up to the hills without any chance to run weights and altitudes through his Flight Manual. In this case you should have already done your homework and have established some estimates on what is possible.

As important as planning is, it is no guarantee of success. There has to be some headwork involved when the actual operating area is reached. Since 1 July 1962 helicopter mountain operations figure in 29 mishap reports. Twenty accidents have resulted because pilots were unable to cope with the high density altitude, vertical currents and turbulence associated with unprepared landing sites.

As an example of planning plus headwork let's take the case of a fairly experienced pilot with 1200 total hours and 1000 helo hours.

Elevation of a mountain camp site where cargo and personnel were to be delivered was 3000 ft MSL. The pilot calculated that the aircraft was capable of hovering in ground effect at that altitude (density altitude would be about 5000 ft). Since the weight was such that the helo would not hover out of ground effect, the pilot had a "fixed-wing" situation on his hands. He had to keep a certain amount of forward speed. However, he had been into the landing site a number of times and no difficulty was anticipated.

When about five miles from the landing site, the



Appearances can be deceiving. This prairie-like terrain is the top of a 7600-foot plateau. During practice landing loss of control resulted in downed helo, seen in center.

2 pilot observed clouds in the vicinity of the mountain top. He continued inbound but turned back when he saw the site was obscured. This was in accordance with briefed procedures.

Then the clouds broke and the helo was maneuvered into a long straight-in approach. When close to the site, clouds again covered the area. The approach was continued while reducing forward speed in the hope that the landing area would clear.

Unfortunately, the landing area remained obscured and about the time a decision was made to discontinue the approach, the airspeed had fallen to the point that the helo began losing altitude. Full throttle failed to prevent it from settling slowly into the trees.

The accident board confirmed that under identical conditions flight could not be sustained without translational lift (forward speed) or ground effect. When forward speed was reduced below that required, settling was inevitable. Lacking adequate air-space above the terrain, a waveoff was not possible.

In effect, the pilot simply painted himself into a corner. But consider what one of the chain-of-command said in an endorsement, and how it might happen to you. "This is a case where a pilot well experi-

enced from the standpoint of hours in type failed to cope with a variation of the unpredictable situations so frequently encountered in mountain terrain. In mountain terrain the winds, shifting cloud cover, variations in temperature and humidity are seldom reported for the actual area of the intended landing site.

"This is undoubtedly the greatest area of challenge to the helicopter pilot; that of attaining and perfecting his judgment and technique to the point of being able to operate the helicopter through its full range of flexibility."

These words deserve a little more attention, because they lead into another aspect of helo mountain flying. It is perfectly logical for a pilot to want to operate his aircraft through its full range of flexibility. And as long as people are human, the "sea level" helo pilot will sense a challenge toward the high altitude portions of his flight manual graphs.

Remember the story of David versus Goliath? Now there was a challenge: David who was young, brave and pure in heart (like you and me, of course) faced the monstrous, evil Goliath who towered over David like a three-story building.

When faced with this challenge, did David dash forward, grab any old rock and let fly? Not on your life! He went off by himself and carefully selected five, smooth, round stones from a creek. Then he advanced toward Goliath. Proving that David knew

preparation is as important as being pure in heart.

With a quick ripple of the typewriter keys we can shift from stones to helos and the story of a pilot who faced a Goliath-like challenge and didn't quite make it to the top. The reason: Lack of preparation. "It is felt," said one endorsement to the accident report, "that lack of knowledge concerning the helicopter's capabilities at altitude is the only really significant factor involved."

Shortly before noon on a warm, July day, a west coast air station received a request for an immediate helicopter search mission into a nearby mountain range. The request passed through several people and after the pilot was told of the situation it had taken on an urgent nature in his mind. The helicopter had previously been preflighted and turned up and 16 minutes after the search request originated the aircraft was airborne with a total of five people on board.

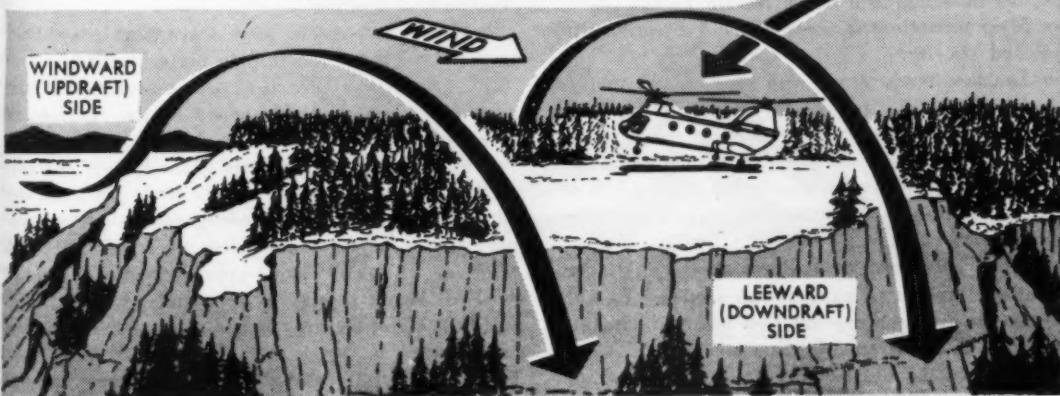
The pilot had a total of 2000 hours with 150 in helos. This would be his first mission in mountainous terrain as aircraft commander. He had one previous mission as copilot operating at 3000 ft MSL in mountainous terrain.

Objective of the search was some equipment which had dropped in a remote area on the side of a mountain. When the equipment was sighted the pilot radioed the location back to base. He was asked to land if at all possible and discharge two men from

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WIND EFFECT ON RIDGELINE APPROACH

1. Approach the upwind side parallel to, or, at as slight an angle as possible to the ridgeline, rather than perpendicular to the ridgeline.
2. If terrain does not permit a parallel approach, make approach as steep as safely possible to avoid leeward burble and downdraft.





Pilot's first high altitude landing ended short of destination.

the helo who would then attempt to recover the equipment.

A Ranger Station on the top of a 6000-ft mountain appeared to be the nearest possible landing site and the pilot advised he would land there and discharge the two-man recovery team.

Here is an appropriate place to review the guide lines for mountain and rough terrain flying:

- Make a continuous check of wind direction and estimated velocity.
- Evaluate temperature with the thought that it may increase as you get close to the ground.
- Plan the approach so that an abort can be made downhill and/or into the wind without climbing.
- If wind is relatively calm try to select a hill or knoll for landing so as to take full advantage of any possible wind effect.
- When evaluating a landing site in non-combat operations, execute as many fly-bys as necessary with at least one high and one low pass before conducting operations into a strange landing area.
- Evaluate the obstacles in the landing site and

consider possible "null" areas (loss of wind effect on downwind side) and routes of departure.

• Landing site selection should not be based solely on convenience but consideration should be given to all relevant factors.

• Make a power check: Determine power available and ability to hover out of ground effect prior to attempting a landing.

• Whenever possible, approaches to ridges should be along the ridge rather than perpendicular.

• During the approach smooth movements of the controls are essential. Movement of the controls in a sharp or abrupt manner may lead to loss of RPM.

Now let's see what happened at the Ranger Station.

The pilot circled the area twice while checking the wind and evaluating the landing site. A shallow approach to a hover was decided upon and the H-34 came in with 2700 rpm, approximately 25 inches MAP. It began slowing to approximately 30 kts, 50 to 100 ft above the ground and short of the intended landing site.

As the aircraft approached a hover the pilot ap-

plied 40 inches MAP (full throttle position) at which point the aircraft began to settle with rotor RPM starting to decrease.

When RPM passed through 2200, the pilot warned the crew and passengers that they were going in and he applied maximum collective prior to touchdown. The helo hit hard, landing on an approximate 15-degree incline 200 ft short of the landing site. Fortunately, there were no injuries. The Ranger Station was found to be abandoned.

Although it does not sound as if the pilot made any gross errors, a comparison of the mountain helo guidelines and his actual procedures does show some omissions.

In orbiting the landing site the pilot estimated the wind as calm but made no estimate of the air temperature, except to note that it was "warm." Later calculations of the conditions gave a density altitude of 8000 ft.

No check of "power available" was made prior to commencing approach thus the pilot did not know how close he was to maximum under prevailing conditions.

The approach was too shallow to provide an adequate abort route in the event of unforeseen difficulties.

These were small details but important ones. According to the graphs and charts the aircraft should have been able to do the job. In actuality it was being asked to operate at the top limit of its capabilities.

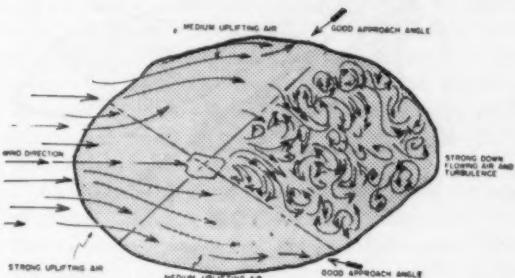
The stranded pilot's statement throws some light

on this aspect. "At about 1515," he said, "two helos arrived at the crash scene, one Coast Guard and one from NAS. The helo from NAS made several passes and finally came in from the north. By this time a 10-kt southerly wind had come up.

"I set off a smoke bomb to give the pilot further wind direction. He came into a hover and lowered the sling. My crew looked rather apprehensive that another helo of the same type as ours could hover and pick up anyone. I handed my flare to one of the crewmen and ran out and got in the sling.

"As I was pulled into the cabin, I felt the helo start to settle. We hit the ground and I bumped my head on the overhead. I got out and talked to the pilot, advising him to come back later in the evening when it was cooler.

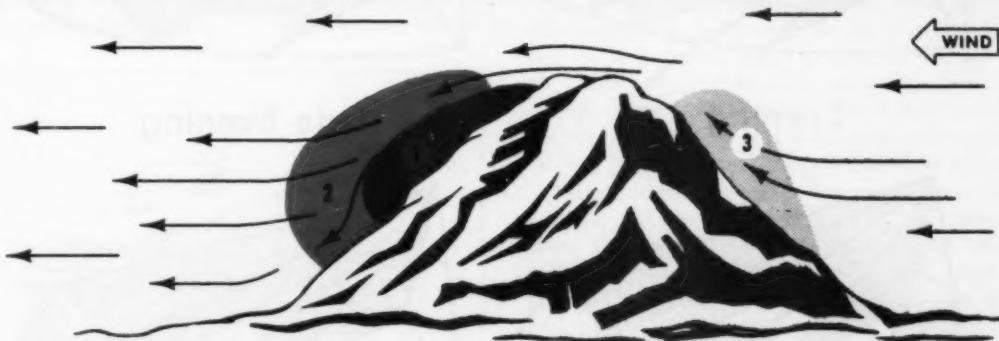
"He took off and another NAS helo appeared to be coming in for a landing try but we waved him off.



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Helo approach to a hilltop can be made from the side if turbulence exists downwind.

WIND FLOW OVER AND AROUND PEAKS

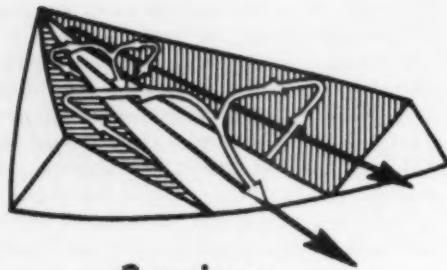


1. Null area usually found on leeward side at crest of slope.

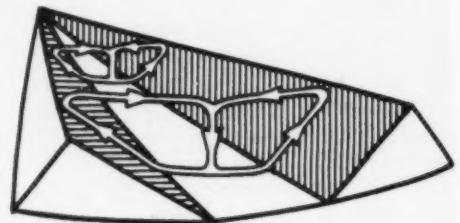
2. In very strong wind conditions, and/or on very steep slopes. Turbulence will be found on the leeward side of the slope in clear air.

3. Updrafts will extend above the surface further than the turbulence, depending on wind speed.

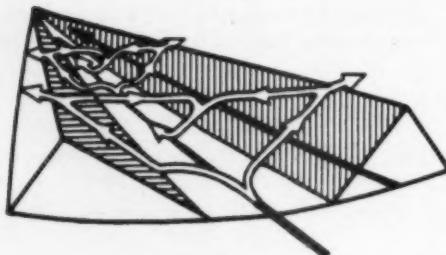
CLASSICAL CIRCULATION IN A TYPICAL VALLEY



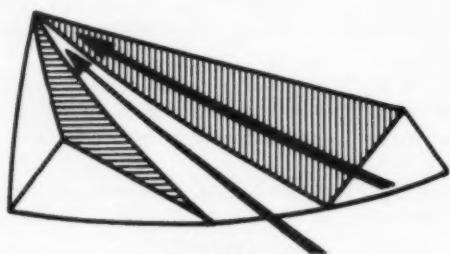
Sunrise



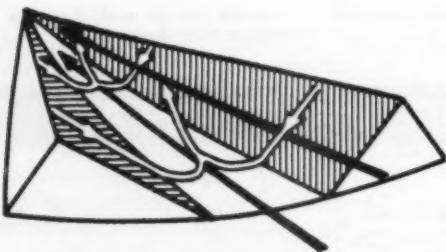
Forenoon



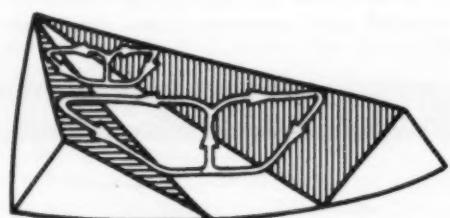
Noon



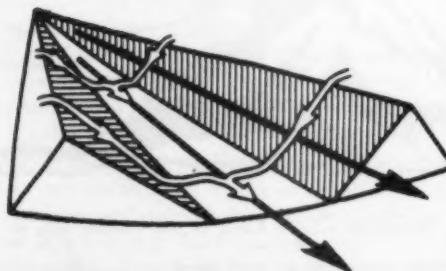
Late Afternoon



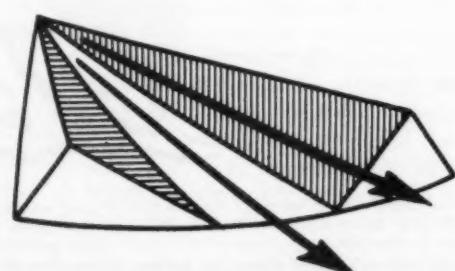
Evening



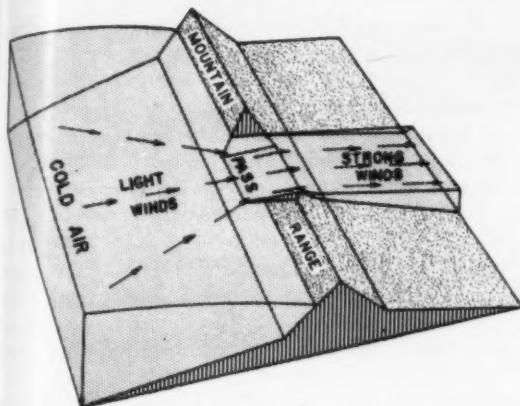
Late Evening



Middle of Night



Late Night to Morning



The Coast Guard helo then came in and picked up one man. A short time later he was back, minus a copilot and internal gear and he picked up two men. On his third trip, the remaining crewman and I were picked up.

"In my opinion this accident could have been prevented had I refused the request that I land. (*Once the equipment was located the urgency of the mission decreased but this was never passed to the pilot.—Ed.*) I believe that I used proper procedures, but that the performance required of the helo was on the borderline of performance available. It is possible that had I made a precision type approach from a higher altitude, that I would have discovered the power deficiency early enough to have effected a waveoff."

What can you as a helo pilot learn from this accident, especially if mountain flying is not yet in your logbook? First of all, if you hunt hard enough

through the Flight Manual, you will find a caution that the performance figures to be derived from the Appendix are guides, not decimal point guarantees. Secondly, what does the helo pilot have the most control over? Weight, of course.

So, load your aircraft to leave a healthy margin for error. If calculations show a proposed flight will be at the max limit, the apprentice mountain man may want to divide the load and make two trips instead of one. Decide if it is mandatory to have the tool box and crew chief as payload. As experience is gained work toward maximum effort. Mountain helo flying is *advanced* flying. You're doing nobody a favor to settle into the ground short of destination while learning the ropes.

The number one guideline for mountain and rough terrain concerns wind; make a continuous check of direction and estimated velocity. Naturally this is not an exclusive rule for extreme elevation. It applies right on down to sea level. (Several classic cases of adverse wind effect on helos have occurred in the vicinity of the blimp hangar at Lakehurst, elevation 91 feet.) Wind flow in hills and mountains is a problem because of its erratic, unpredictable nature. However it does follow certain general laws.

Wind action is given various names from the type of terrain. "Channeling" may occur when the wind flow is across a valley but not at a right angle to it. The surface wind direction may turn parallel to the valley.

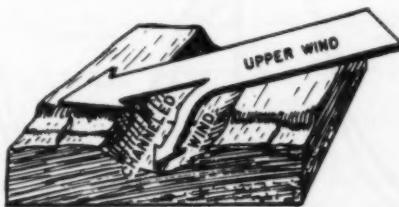
Light winds can often become much stronger when they are forced to converge and "funnel" through a narrow pass. Other local "deformations" of the air mass occur as it flows through a gorge or over a hill.

To further complicate the local wind flow, the valley-slope circulation must also be considered. During the day, the air over the slope is warmer than air at the same height over the valley. The rising of this warmer air creates a well-defined wind up the slope. The reverse is true at night, and the colder air over the slope flows downward into the valley.

The air within the valley becomes warmer during the day and, rising, is replaced by air from the plain. During the night a reversal occurs, and the air flows down the valley out to the plain. Slope and valley circulations decrease with height and disappear completely at about the tops of the ridges forming the valley.

A very localized feature is the heating of one side of a valley, as by the morning sun, while the other side remains in shadow. This may result in

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Channeling of wind by a valley.

overturning of the air (warmed air rising on the sun side and cooler air sinking on the shaded slope).

Unfortunately, these typical terrain-temperature situations are not what the helo pilot often finds. One pilot attempted a rough area landing in a box canyon and as he got close to the spot he settled into the ground unexpectedly. Later it was found that when descending into the box canyon under conditions of light wind, there was a rapid rise in temperature with a difference of seven to eight degrees from the surrounding area.

Then there was the helo pilot who attempted to takeoff near a fire area. He was unsuccessful because of one small detail. The nearby flames had increased the local temperature beyond the helicopter's operating capabilities. So when mixing heights, hills and helos, nothing is ever likely to be normal.

From the beginning of helicopter training, pilots are taught to "keep your turns up." Rotor RPM is the critical factor since it determines the air velocity over the blades. Engine power keeps the rotor blades turning and horsepower is a function of engine RPM. At lower airspeeds it takes more power to go slower. The elements of this triangle (airspeed, power and RPM) are shown on the charts below.

The charts are approximate for an H-34 but are only a representation and should not be applied to specific problems.

An approach to a rough area landing or at high altitude is usually made with maximum allowable RPM (2800 for the H-34). However, an examination of the actual charts in the H-34 Flight Manual shows slightly better weight lifting capability with 2700 RPM. Why then, is maximum RPM used for approaches?

The curves at right are approximate for the H-34 and illustrate the power available and power required for two rpm's and two altitudes. Weight is constant at 13,000 pounds. At sea level and 2500 rpm, power available is less than power required to hover out of ground effect. At 2800 rpm there is 100 brake horsepower in excess of hover requirements. Somewhere before the RPM deteriorates to 2500 rpm the helo will fall.

At 6000 ft hovering out of ground effect is not possible.

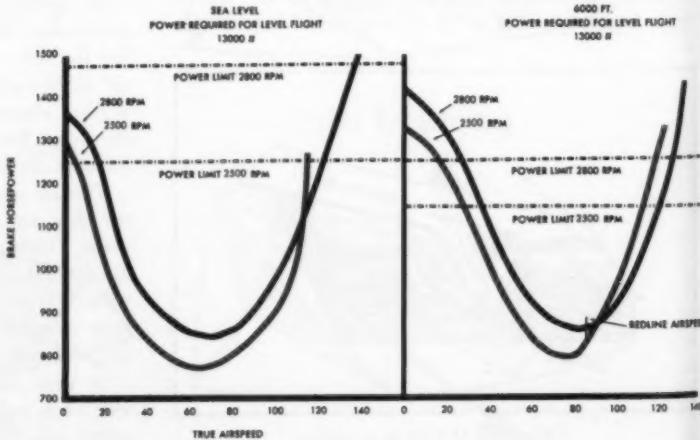
It is easy enough to lose RPM but rougher than a cob to try to increase it when you are committed. If you start with a high RPM and lose a little, for example from 2800 to 2700 rpm, your position has not been hurt—if no more RPM is lost. Curves on the charts show the results when too much RPM is lost; the power limit or power available decreases.

Note that on the charts minimum power required for level flight is from 60 to 70 kts TAS (bottom of the curves). Using this speed range gives the maximum excess brake horsepower available, 640 excess BHP at sea level at 2800 rpm for example. Therefore, best climb will be at that airspeed which provides maximum excess BHP and it is not mere coincidence that the H-34 NATOPS/Flight Manual says climb at 70 kts. A recent accident shows the possible consequences when such a point is overlooked.

The flight was a logistic support mission with cargo to be picked up at a mountain Ranger Station heliport and then carried to a site further into the mountains. Upon arrival in the vicinity of the Ranger Station a low and slow approach was made and personnel on the ground were able to point out the direction of the heliport by hand signals. The site was a cleared area on a slope approximately 450 ft higher than the Ranger Station and approximately 1500 ft distant.

After spotting the landing site, the pilot turned, departed directly toward it, and commenced climbing. "In starting a 40 kt climb to the landing area," he said, "I pulled about 45 inches MAP with approximately 2600-2700 rpm.

"The climb seemed to start normally. Then I noticed the airspeed drop off and the RPM begin to deteriorate. To my recollection I had not increased



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The last moments of 303. Seconds later a climb toward heliport ended in trees (see text).

power."

Witnesses noted that as the aircraft neared the landing site, the rate of climb appeared to diminish in relation to the terrain. The helicopter then veered slightly right, clearing a ridge which projected from the landing site. It passed near the landing site and proceeded into a rapidly rising box canyon. The aircraft settled to the floor of the canyon and caught fire but none aboard were injured.

The steps which led to the point of impact are summarized by a paragraph from the accident report: "Progress of the flight was normal until the aircraft transitioned from a near hover over the Ranger Station to a low airspeed, steep climb over rapidly ascending terrain with a quartering tail wind."

Based on the information in the NATOPS/Flight Manual and the prevailing conditions in the area, the accident board determined that the maximum increase in altitude that could be attained in the distance involved (maintaining 40 kts and 45 inches MAP) would be approximately 325 ft. The altitude gained did exceed that 325 ft but airspeed and RPM were sacrificed for altitude in order to remain

clear of the terrain.

In so doing, the aircraft entered an emergency condition. When the pilot recognized the fact, he attempted to recover by dropping the nose, increasing throttle to full on, and lowering the collective. This action was taken well past the effective recovery point and the aircraft settled into the trees.

By referring to the power curves previously discussed, you can see that the three elements of Power, RPM, and Airspeed result in a tricky triangle. The effects can be summarized as follows:

- Power required increases very rapidly when the airspeed falls below the minimum power required airspeed (approximately 60 kts TAS).
- Power required does not vary much with altitude.
- Power available changes rapidly with changes in altitude.
- An increase in either RPM or airspeed will increase amount of excess power or decrease a power deficiency.
- An increase in both airspeed and RPM will make a startling change in power excess at any altitude.

Automatic Power Compensator

HOW GOOD IS IT?

With APC being considered for other jets, F-8 experiences should be of interest to everyone.

By LCDR L. P. Walsh
LT D. L. Albritton
VF-124

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In August 1964 Fighter Squadron 124 commenced FCLP training of Fleet Replacement Pilots utilizing the Approach Power Compensator (APC). The replacement pilots flew manual approaches until they exhibited satisfactory performance. Thereafter, subsequent FCLP periods commenced with a minimum of two manual approaches then the APC was utilized for the remainder of the period.

Although it was planned to give each replacement pilot 10 day and 20 night FCLP periods prior to deploying, aircraft availability and weather factors limited the number of periods to an average of about 8 day and 17 night.

An evaluation of the APC approaches determined that the rate of improvement of pilots utilizing APC increased faster than that of the pilots flying manual approaches during the FCLP phase. This improvement allowed pilots to become more demanding of their performances and to better control the meatball and lineup.

Manual approaches also improved at an accelerated rate giving a higher state of training than before APC was used. Statistics show that the fleet replacement pilots who were field qualified with the APC were ready to commence their night qualifications with half as many approaches as required by the manual approach group.

The APC group had 25 pilots with each making 4 arrested landings manually early in the carquals phase. The remainder of the day landings and all night landings were made utilizing APC.

The following statistics compare the results of the two groups evaluated. The manual approaches made

by the APC group were excluded, although they actually would have improved their boarding rate.

Day Approaches		
	MANUAL	APC
Touch and go	93	67
Arrested	496	262
Bolters	151	49
Waveoffs	95	24
Total	835	402

boarding rate .668 boarding rate .782

Night Approaches		
	MANUAL	APC
Arrested	169	168
Bolters	117	129
Waveoffs	105	46
Total	391	343

boarding rate .432 boarding rate .490

Pilots' reaction to the APC was outstanding. The more experienced pilots initially felt that they could outperform the APC; eventually, however, they were convinced that their passes gained consistency with the APC, especially at night.

Pilots discovered that the two hardest corrections were the high- or low-in-close situations. By stopping the upward movement of the meatball rather than trying to recenter it, the high-in-close problem was remedied with the APC without inducing an unacceptable sink rate.

The low-in-close condition would not be corrected consistently with the APC. The pilot that was too smooth continued low or went lower; the rough pilot tended to overcontrol the nose and went over the top, bolting. Thus, APC was manually overrid-

den with the application of power in low-in-close situations.

The greatest factor affecting the APC approaches, seemed to be the amount of pitch trim used in the approach. If the pilot used a little less nose up trim than required for "hands off" flight on the glide slope, it was found that his nose control improved. Using "hands off" trim gave the pilot the uncomfortable feeling of having to dive for the deck on every approach and resulted in excessive bolters. However, if sufficient nose-up trim was used, requiring "excessive" back pressure, it led to unconscious nose dropping. The pilot should not trim the aircraft to the "slight back pressure required" condition prior to entering the glide slope. Hands off trim should be employed to this point—then if the pilot's attention is diverted the nose will not drop with the consequent reduction in power. This is particularly important at night when proximity to the water cannot be visually determined.

LSO reaction to the APC was also outstanding. It permitted them to be more critical of glide slope and line-up control without decreasing the boarding rate. With more time available for observation of aircraft attitude, which is the performance guide to the APC, the LSO can shrink the approach corridor, which should lead to safer operations.

The only difference in the LSO/Pilot communications was the addition of the "attitude" call. This was used for all conditions where a pilot had dropped his nose to less than optimum attitude, except when the aircraft is going below the glide slope in close or has established an excessive sink rate at the ramp. Under these exceptions, the old standby "Power" is employed.

During the evaluation period, both the APC group and the manual group each had one night landing accident. The accident suffered by the manual group resulted from a decelerated underpowered approach then a settle at the ramp. APC may have prevented

that one. In the APC group, the pilot overcontrolled the nose attitude in an attempt to stop a rising meatball and dove for the deck.

Evaluation of the APC showed the following advantages:

1. Airspeed is maintained within a four knot range allowing a more stabilized glide slope.
2. Glide slope corrections require movement of only one control (the stick) decreasing the complexity of coordinated control movements.
3. Inside the cockpit scan is reduced allowing the pilot to concentrate on glide slope and line-up.

However, there are some disadvantages also:

1. The pilot must be retrained to make all glide slope corrections by employing attitude changes. This is foreign to the basic teaching on airspeed control with attitude and altitude control with power.

2. Close-in corrections are very critical. The pilot must discipline himself to make smooth minor nose corrections or else he will overcontrol his attitude changes. This is especially critical at night when external visual reference for attitude corrections is marginal or non-existent.

Since the advent of the APC in the *Crusader*, carrier landing statistics have improved slightly. CNAP statistics for the first six months of fiscal 1965 compared to fiscal 1964 indicate a reduction of approximately one carrier landing accident per 10,000 landings.

However, the environment in which the *Crusader* has been operating has also changed. Increased night operation from 27C class aircraft carriers has appreciably increased the hazard of *Crusader* carrier operations. Despite this increased hazard, the *Crusader* carrier landing accident rate has improved.

The overall effect of the APC appears to be that the aviators released to the fleet are more proficient in carrier work. This has been accomplished by improved FCLP performance without an increase in FCLP sorties. This higher state of proficiency is also reflected by a reduction in required deck time.

The big question is: Will the APC reduce accidents? Yes, if used properly. However—smooth attitude control is an absolute must. Look at the ramp strike accident where the APC was utilized. The aircraft with the APC will still hit the ramp, by "going-for-the-deck" in close, but he will hit it "on speed." Hard landings and inflight engagements are other pitfalls that excessive nose movements in close may cause.

Note to APC users: Be smooth with that nose—The APC, when used properly, will reduce your accident rate and improve your boarding rate.



By LCDR C. B. Sawiak VP-31

12

Some Thoughts on Flight Instruction

**As a naval aviator, the chances
are good that you will eventually
fill the role of a flight instructor.**

Although we may not often realize it, the majority of Navy flight time, even *excluding* the formalized instruction in the Training Command and the RAG squadrons, is actually training time.

This is easier to believe when we stop and consider that all squadrons maintain individual training programs, requiring each new pilot to go-the-route, so to speak, before he is considered fully checked out. Also, most every command that has aircraft attached has some type of checkout or training program, and requires each new pilot to satisfy the requirements thereof before he is allowed to sign for an aircraft.

The many pilots involved in all this training may not actually classify themselves into student or instructor categories, but the relationship does exist. Frequent assignment changes and the continual introduction of new aircraft mean that much of the flying time of every naval aviator is spent either getting checked out in a new aircraft, or checking out someone else.

As a multipiloted aircraft pilot who has survived his first dozen or so flights as an instructor you may be the first to admit that somehow you felt inadequate . . . as if there was something else you should have learned before going out. Maybe it was just an empty feeling. You may have felt the need for some advice, or have had serious doubts about your instructional ability after returning from those first few flights.

Examine Your Capabilities

What are some characteristics of a good flight instructor?

In the first place, you should be proficient in the aircraft. Some of the old hands may recall being checked out by individuals who did not seem to be much more qualified in the aircraft than themselves.

In order to maintain proficiency, you should fly as frequently as possible. You may be well-qualified to instruct on most any type of flight but infrequent practice will be detrimental to your reflexes and your confidence in the aircraft. Students seem to have a knack for detecting when an instructor lacks confidence, whether it be in his knowledge of aircraft systems, his flying ability or his instructional techniques. Your student will learn better if he senses that you are capable of teaching him well. This requires that you be confident in your own instructional and flying ability.

Another thing to keep in mind before going out on that first teaching hop in a multi-engine aircraft is that you will be occupying the copilot's seat, a spot that may be less familiar to you from an aircraft handling standpoint. How well can you land the aircraft and handle all emergencies from the copilot's seat? Ever done it? If not, perhaps it would be wise, if feasible, to get a hop or two with another checked-out pilot and practice handling everything from the copilot's seat before you go out on that first instructional or checkout flight. The dexterity you gained through such practice might prove invaluable later on.

Evaluate the Student

Now how about these students you'll be dealing with . . . will they all respond to your instruction in the same manner? You can bet they won't. Individuals just naturally learn in different ways, whether checking out in an airplane or learning to hit a golf ball.

One student may be hesitant in flying with you because of your disposition, seniority or reputation. Another may still be in the greatest-gift-to-aviation stage. Still a third may be well-prepared for the flight while the next one may not have even cracked the NATOPS manual.

The point is that some thought should be given to the student's background, motivation and personality before the flight, if such information is available. This will enable you to adapt your techniques, to some extent, to accommodate the particular needs of the individual student. For example, it's a waste of time to snow a slow learner with maneuver after maneuver if he is still stumbling on the first one. On the other hand, some sharpies will pick it up faster than you can pass it out. Take a close look at your student before the flight. Chances are that



Fly as frequently as possible to maintain your own instructional and flying skills.

both of you will benefit.

Your Homework

Just as the student is expected to do his homework before a flight, so is the instructor. One of your most valuable tools is the student's flight training folder. It should contain a record of all his previous flights in your unit. Review this training folder before getting into the aircraft. It can give you much valuable information as to the student's ability and his previous flight difficulties, if any. If he is weak in some area and you have some time left over at the end of a flight, do him a real favor and use that time to instruct him in his weak areas. A good review of the training folder will provide a guideline for stressing particular areas and also clue you as to what to expect from the student in flight.

Using the Syllabus

One of the greatest aids to good instruction is a well-written syllabus, with a detailed listing of all maneuvers required on any particular flight. This expedites briefing on the ground and facilitates maximum use of instructional time in the air. It gives the conscientious student a guide for preparation before the flight. If your unit doesn't have a formal syllabus, or if it is vague, it would be a good idea to get with



Let the student know your basic plan for the flight.



Review the training folder before the flight

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the student at least one day before the hop and tell him what he will be expected to know, so he can make adequate preparation.

The Briefing

Thorough preflight briefings are vitally important. During the brief let the student know your basic plan for the flight. For instance, "We will fly VFR to the Podunk area and do the high work, after which we will proceed to Always Ready VOR and then shoot GCAs at NAS Fogbound and so forth." He can do a better job if he has some idea of what is coming next.

Another matter to discuss during the brief is cockpit discipline, or, who does what and when.

Three sets of hands on the same mixture control tends to cause confusion. One of the basics is, who has control of the airplane. Make sure there is no doubt as to how you will transfer control of the aircraft. Use standard procedures and phraseology, such as "I have the aircraft," accompanied by shaking the stick or yoke and patting the top of your head, assuming you are the one who is taking control. Impress upon the student that he is to continue flying the airplane, even though he feels you on the controls, until such time as you say "I have the aircraft." Only then is he to relinquish control and standby to assist. The reason for this admonition is to preclude his releasing all control, during a landing for instance, simply because he feels you assisting on the yoke during touchdown. Otherwise, you may suddenly find yourself careening toward the side of the runway with no one in control after you had merely added a little pressure on the yoke to correct the landing attitude. It has happened before.

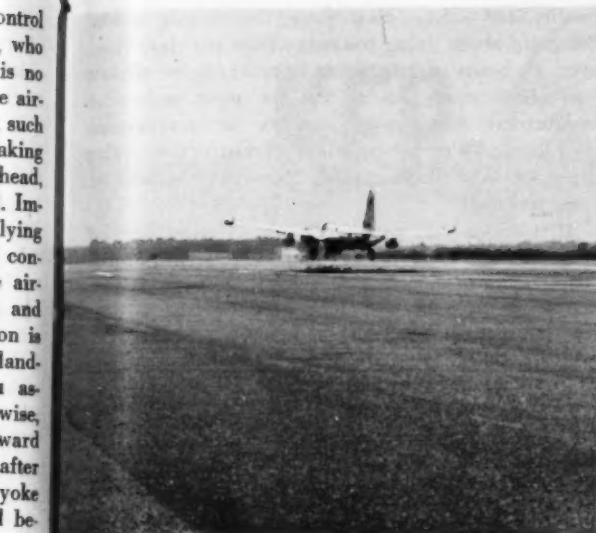
The procedures for handling actual emergencies should also be covered thoroughly during the briefing. In other words, who is going to handle *what* and *how* if something really goes wrong?

Aborting the takeoff is an especially critical area and it should be briefed exactly as you'd expect to handle it during an actual emergency.

Engine failures also warrant specific comment during the brief. As the instructor, you should emphasize strongly that you alone will feather a malfunctioning engine unless you give specific directions to the contrary. More than one instructor has found himself flying around with the wrong engine caged, or a usable engine unnecessarily secured because an overzealous student beat him to a feathering button.

When emergencies occur during the inflight phase, and time permits, it is a good idea for the instructor to shift seats with the student and get into the pilot's seat. Few students will view this as a slap to their ability, but will recognize it as good common sense. Most multi-engine aircraft are handled more easily and familiarly by the pilot from the normal pilot's seat. If you have an emergency give yourself every advantage. Get into the seat where you feel most comfortable and brief the student as to how you expect him to assist you during the landing. If the bird is likely to get bent during an emergency situation, you, as the instructor and pilot in command should definitely be in control of it.

During the flight you'll have to be constantly deciding just how far you are going to let a student



Landing long could prove to be a dead-end street

go before taking control of the aircraft. Two tools are very valuable here. One is NATOPS and the other is a lip mike. From the beginning insist that your student stay within the guidelines of NATOPS for your particular aircraft. When he strays beyond the boundaries call it to his attention by using your lip mike, leaving your hands free should they be needed.

Inflight Techniques

During the landing phase most students can be talked through a good approach and landing with at most a slight application of pressure on the yoke just before touchdown. The point here is that you should try to keep the student within the general framework of a good approach at all times, but, if it gets too bad go ahead and wave off rather than try to salvage the situation. Under such conditions you would most likely end up making the landing anyway.

If you start to feel uncomfortable at any time during an approach, and have any doubt as to your ability to correct this situation, wave off or take control and start all over again. This is particularly applicable during the initial phases of teaching a student how to land the aircraft. Unless he is required to fly the standard normal approach during this initial phase of his training, he may never do it, simply because he doesn't know how it looks. Make sure he understands the standard approach and can satisfactorily demonstrate it before allowing any deviations.

Your student is ready for emergency type landings only after he has consistently demonstrated good normal landings. Otherwise he will simply be doing both normal and emergency landings poorly. As your student's proficiency increases during the landing phase, cut down on the extent of your comments and finally cease them altogether after he appears completely confident . . . unless he gets fouled up again. If things continue to sail along smoothly chances are that you've done a good job . . . congratulations.

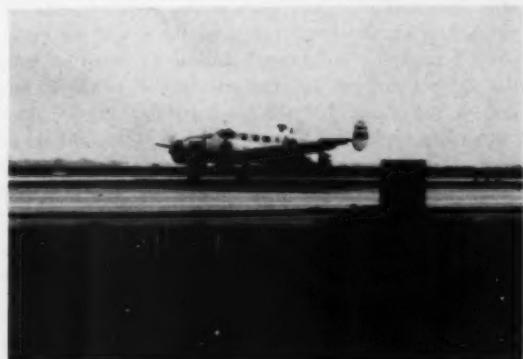
Compounding Emergencies

A frequent topic of conversation between instructors, and particularly check pilots, is that of compounding emergencies. Should we or shouldn't we? Most instructor pilots feel that practicing compound emergencies probably causes more actual accidents than the benefits of the instruction prevents. A study of accidents in which more than one type of emergency existed would probably disclose that in many cases the second emergency was caused by the pilot not handling the first one correctly, or by not recognizing that he was in an emergency situation until he got the second emergency. Taking off in bad weather with a sick engine, and then developing electrical failure, might be a good example. It is far better to avoid situations like this altogether.

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Landing Problems

Many instructors have wound up on a veritable dead-end street by allowing the student to land long. It's easy enough to get into this situation. The student is doing nicely throughout the entire approach, maybe a little high and fast on final but looks like he'll touch down just beyond the first third of the runway, and there is plenty of concrete remaining after that point. Touchdown is about halfway down the runway, and then the reversing doesn't work as



Touchdown . . . a good place to know who has positive control of the airplane.

advertised, or one brake fails or a tire blows. From then on, the plot is the same, only the players change. If your student can not land in the first third of the runway (and this constitutes a box about 1200 feet long on most runways) he needs more practice on the landing pattern and waveoffs. The landings can come later.

One pitfall of the easier-to-land tricycle geared aircraft is the porpoise. A porpoise is more likely to develop when the airplane touches down fast and flat. This is caused in turn by being high or fast or both on final. We've already recommended adhering closely to the guidelines for a standard approach, but if you still get into a porpoise during an instructional flight the smart way out is to simply take it around. Trying to salvage a landing out of a porpoise is tricky at best, and except in rare instances, such as terrain features around the field, or weather, it is uncalled for.

Grading the Student

Let's talk a few minutes about "grades." Until you fly with enough students to judge one against the other most of your grades will probably say "average." But when you've progressed to the point where you can recognize an "outstanding" or an "unsat," don't be hesitant about writing it down. There is a strong tendency to take the easy way out when evaluating a hop, and overlook glaring errors or call the hop incomplete. Unless the flight could not be completed because of weather or mechanical problems there is a good possibility that it was unsatisfactory.

Getting a "down" or "unsat" on a flight carries more of a stigma in naval aviation than it should. Sure, we would like to have all the students progress smoothly through each hop of a syllabus, but it is unreasonable to assume that every student will be able to satisfactorily complete the requirements of every hop on the first try. Thus there will be occasions for giving a "down," and if in your opinion the student did not satisfactorily complete the flight, and is not ready for the next syllabus flight, then your course of action should be clear. He will benefit from further instruction in the form of one or two review flights. You will be doing the student, and the next instructor who flies him, a favor by stopping right then and getting him squared away before he progresses further, and the problem magnifies.

Physical Limitations

One pressure which you may find yourself exposed to is the question of just how much instruction time in the air can you fly each day and still maintain

quality and safety. Most young instructors seldom complain about flying too many hops per day. However, six hours of instruction in multi-engine aircraft just about wears out all but the most zealous of instructors. Also, most students in multi-engine training seem to get little out of instruction flights after the first three hours. There is a saturation point for both.

If it seems that you have been given a little bit more than you can safely handle (and you are the best judge of this), then say so. If you are one with a reputation of carrying your share of the load in the squadron, your recommendation will be respected. Schedule officers would like to be equipped with a crystal ball, but unfortunately, none are, and they may inadvertently schedule an individual instructor or student for more than he can handle in one day.

Copilot Training

Although we normally think of instruction as involving formal training hops in which an instructor and a student go out and complete certain maneuvers, an alert plane commander will look for opportunities to train the other pilots in his crew even on operational missions, *should conditions be favorable*. Pure training flights are often scarce in operational squadrons and the junior pilot may find that snatching opportunities, when and where they present themselves, may be the surest means by which he can maintain his proficiency, advance steadily toward his PPC designation and keep up his morale.

The plane commander is often torn between the desire to train his pilots, which is one of his responsibilities, and his all encompassing responsibility for the safety of the aircraft and crew while completing the assigned mission. It just may not be possible to rotate each of his pilots into the first pilot position on every flight. After a 12-hour patrol the PPC may be reluctant to let the third pilot make the landing, even though the weather is good, simply because he is tired and realizes this could have an adverse effect on his reaction time should the PP3P (probably tired also) get into trouble and require his assistance. You may have heard of plane commanders who rotate landings in their crew regardless of the circumstances, but if this is actually the case, it gives you something to think about and question.

The object here has been to present a few points of guidance to which it is hoped the new instructor will give some thought. The old pros will be the first to recognize, however, that this article has only scratched the surface in an area that might well stand a good plowing.

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KER-

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WITH the progress of medical science, physicians have been enabled to effect amazing cures of dread diseases. But, since before the time of Hippocrates, none has found a cure for the common cold.

What is a cold? Caused by one or more of a variety of filterable viruses, the common cold (or "acute coryza") is an infection of the upper respiratory tract (nose, throat, trachea or windpipe, and the bronchial tree or branches of the windpipe to the lungs).

Factors which seem to facilitate infection include chilling, hay-fever-type allergies, and inhalation of noxious fumes. Once the omnipresent virus has a "ripe" respiratory tract to work on, it attacks its victim in the all-too-familiar way: sneezing, runny nose, "clogged head," headache, sore throat, generalized aching, etc. From 4 to 10 days it will wield its discomfort and will defy all efforts to shorten its course.

The virus of the cold is passed from person to person, either directly (sneezing on someone) or indirectly (using someone else's coffee cup).

Discomfort and the chance of complications are diminished with rest, fluids, protection from exposure and fatigue, and medications. Aspirin, antihistamines, nose drops, and cough syrup are some of the drugs for treatment, but none effects a cure. The cold virus laughs at antibiotics (penicillin, streptomycin, tetracycline, etc.) because it is unaffected by them.

The complications of a cold include sinus infection, ear infection,



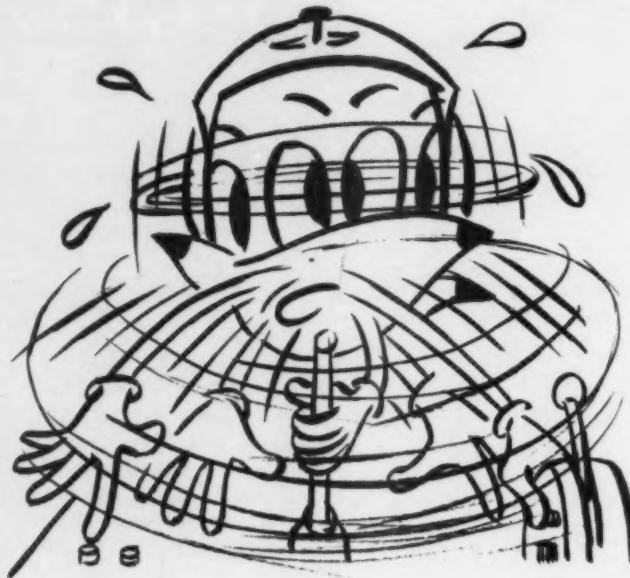
and lung infection, and are usually caused by bacteria which race in to thrive in the environment of lowered resistance. Treatment then can include antibiotics which DO kill bacteria. Hopefully, treatment of the primary infection will preclude the development of complications.

Why not fly with a cold? First of all, the mucous membranes become swollen. These membranes line the sinus cavities and Eustachian tubes as well as the nose and throat. The Eustachian tube runs from the naso-pharynx to the middle ear and plays a major role in clearing the ears on descent from altitude. If the membranes are swollen enough to close the Eustachian tube, equalization of air pressure between the environment and the middle ear will be prevented. Result: ear block or sinus block. OWWW! It smarts sharply. Ask the man who's had one! If the pressure in the middle ear or in the sinuses cannot be equalized with environmental air pressure during descent, a sort of vacuum occurs in the middle ear or sinus. Fluid or blood then seeps into or is drawn into the vacuum area. Troubles then begin full force.

A second good reason for not flying with a cold is that many of the drugs that relieve nasal congestion and other cold symptoms contain antihistamines, drugs that induce drowsiness and decrease efficiency in many people. Even the APC ("the peanut butter of Navy medicine") can cause side-effects. DON'T FRY WID DAD CODE!!!

—LT Ronald J. Amalong, MC

Dexterity



18

Flying aboard . . . Another Med deployment coming up and the A-1s were headed for the ship.

"I was wingman in a section of two aircraft. After 35 minutes of flight, we checked with Approach Control."

Approach Control directed the flight to Marshall nine miles from the ship at 4000 ft. Everything was normal.

"The section leader commenced a starboard climbing turn, and went to normal rated power—2600 RPM and 40 inches. I pushed the prop forward to 2600 RPM, placed

the mixture in RICH, left the fuel boost pump OFF, and began adding power.

"As the manifold pressure reached 33 inches, the engine stopped cold.

"I lowered the nose, leveled the wings, checked to make sure the fuel was on main cell and switched the fuel boost pump ON. The engine did not start."

The aircraft was seven miles from the ship.

"I checked the fuel pressure needle, 23 psi, normal pressure. The engine was unwinding. I ap-

plied steady prime. The engine caught. With steady prime, the engine ran extremely rough alternating between a backfire and a power stroke—almost with a rhythm. I reduced power to 25 inches to lessen the severity of the backfires. The power remained at 25 inches for the duration of the emergency."

With left hand on the stick and the right hand applying steady prime, the pilot commenced a straight-in approach to the ship. Calling the ship presented another problem.

"I pressed the mike button with my left thumb—and was forced to grab for the stick with my right hand. The aircraft had been trimmed in a nose high attitude and tried to climb. As soon as I released the primer and grasped the stick with my right hand, the engine would quit again. I let it unwind while I talked to the tower."

The aircraft was cleared for a straight-in.

"As I was headed toward the ship I made the decision to land aboard. The aircraft was shaking violently and I could see the cowering jump during each backfire. My section leader reported that I was trailing smoke. The aircraft was losing altitude.

"At two miles I lowered the gear and hook and as I decelerated from about 180 kts, dropped half flaps.

"I was flying with my left hand and holding steady prime with my right. The pass was made high and fast—about 102 kts with the ball almost off the top of the mirror."



The purpose of *Anonymous (anonymous) Reports* is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. As the name indicates these reports need not be signed. Forms for writing *Anonymous Reports* and mailing envelopes are available in readyrooms and line shacks. All reports are considered for appropriate action.

— REPORT AN INCIDENT PREVENT AN ACCIDENT —

At the cut there was plenty of green water between the *Skyraider* and the ramp.

"I took the cut by moving both hands to the left; the left hand to retard the throttle, the right hand to grasp the stick and transition the aircraft. As the wire was engaged, the engine quit with a loud backfire as the aircraft rolled to a stop.

"If I had missed the wires, it is possible that a 'Dilbert Dunker' type exit might have been required. Getting the primer reen-

gaged, the throttle forward and the aircraft rotated would have been difficult under the circumstances."

Post flight inspection revealed that the number eleven cylinder exhaust port section and cylinder barrel had cracked. The exhaust ear section and the top portion of cylinder head were retained in place by an exhaust valve.

The whole incident has a rather ironic twist. The pilot had selected this aircraft instead of taking an assigned *Skyraider* that had a mi-

nor gage malfunction. The squadron maintenance officer took the other aircraft and the gage functioned normally in flight—he landed aboard without incident.

In his recommendations and comments, the Commanding Officer stated, "Quick reaction and excellent thinking on the part of the relatively inexperienced pilot enabled him to fly a straight-in approach, flying with his left hand and applying steady engine prime with his right, thereby saving the Navy one A-1H."

Eyewitness Report

In the airborne phase of rescue operations the weather is of prime concern. The terrain involved may add complications. The following excerpts from a helicopter pilot's report give a picture of rescue operations with bad weather in mountainous terrain.

Operations started the morning after we flew in to the beach. Weather was low ceilings and low visibility. Name the precipitation and it was there—hail, snow, rain, sleet, etc. A pilot's dream!

Nonetheless, everyone was anxious to get out and lend a hand... Charts from the local power company, and pireps confirmed wires from 30 ft to 700 ft above ground level across all valleys. These were our highways.

One of the biggest problems faced was frustration. The weather would close in. Launches were held, and planes already airborne were forced to turn back or land wherever they could—often, just as they reached their destinations.

As one front passed, dripping its contents, another followed close behind. Planes would try time after time only to be stumped by nature.

Reveille was at 0530. It was

still dark, and cold, and raining. The machines were airborne at first light. As they lifted, snow was falling in the mountains to the east. Another front was coming in from the ocean to the northwest.

At noon I was scheduled with a cargo of 1400 pounds of food and medicine plus a doctor, badly needed in a town up the river in the mountains. Our first attempt to get over the coastal mountains was typical. We landed short of the pass and waited for adequate clearance. The doctor said there was another way a little to the north. After checking the MAP we took off. We found the pass but it was clobbered. Snooping a little further we found a small gap between the overcast and the ridge tops and went over.

Just a few miles and we'd be at our destination. We had to hustle. The cold was getting to us (hatches and cargo doors open in case of a forced landing) and fuel and daylight were running out.

We made it to within three miles of the town and, bam! A solid wall of snow hit. Too late to land and wait. We had to turn back. Enroute a squall line could be seen bearing down on us. I

added power, recalling a clearing we'd passed. It was a draw... we landed just as the snow really hit.

A farmer sheltered us for the night. Next morning we cleaned the accumulated snow and ice off the machine and cranked her up. On the way to the base we were in snow again and while I was concentrating on instruments the copilot's hands moved up and down in a frantic motion. The tops of two giant redwoods suddenly passed above the level of the cockpit, one on each side. And the radar altimeter indicated better than 400 ft above the ground!

Later in the day the weather cleared more than enough for successful missions.

No one has to be convinced when people are in trouble. Nothing hits closer to home than seeing a small child, too cold, too scared, and too miserable to take a piece of candy.

Some degree of risk was apparently justified in this situation, as evidenced by the issuance of a special waiver permitting VFR operations in conditions of a 100-ft ceiling and 1/4-mile visibility.

But not just any risk!

Reader

Questions Headmouse A Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Sea Survival Training

Dear Headmouse:

Does Clothing and Survival Equipment Change 5 (parachute deflation pockets) eliminate the need for parachute water landing training?

WETMOUSE

► Based on information from CNO in a letter to the Chief of Naval Air Training (OP-561C1/cs ser 264P56 8 Mar 1965), the answer is no, installation of Change 5 does not eliminate the necessity for deep sea survival training. Change 5 is not a panacea but a developmental step in a continuing program to eliminate the danger of drowning by parachute drag. Its reliability factor cannot be assumed as being 100%. An urgent requirement for instruction in parachute harness release during water drag conditions under realistic training environment continues to exist. It is of the utmost importance that men flying naval aircraft be provided the necessary training to increase their chances of survival in the open sea.

Very resp'y,

Headmouse

Summer Flying Gloves

Dear Headmouse:

Whatever became of the evaluation of the new fabric/leather glove which may eventually replace the Navy's present yellow summer flight glove?

WONDERMOUSE

► Evaluation of the new fire resistant polyamide fabric/leather glove (MIL-G-81188) has been completed. The new glove is presently undergoing engineering changes to correct minor deficiencies. Meanwhile, the present supply of yellow gloves is to be used up. Then, as an interim measure because of the long lead time anticipated by BuWeps before the new glove will be in the supply system, use of USAF glove MIL-G-38309A has been authorized.

Very resp'y,

Headmouse

Knife Pocket on MK-5A

Dear Headmouse:

Where are we supposed to carry our survival knife when we wear the MK-5A anti-exposure suit?

NO-KNIFE-MOUSE

► This is a problem at present without a solution. You cannot

have your parachute rigger sew or cement a knife pocket on your anti-exposure suit because, as you know, this can jeopardize the suit's waterproofness. BuWeps has requested that user activities refrain from attaching additional pockets directly to the Mk 5/5A suit and that requirements for specific pockets be submitted to the Bureau of Naval Weapons. BuWeps has under advisement an NASC-endorsed proposal for installation of a survival knife pocket on the Mk 5/5A anti-exposure suit. In the meantime, some pilots carry their survival knives attached to their survival vests or in sheaths on regular Navy web belts worn around the waist.

Very resp'y,

Headmouse

Light On Helmet

Dear Headmouse:

I heard recently that some A-4B pilots are attaching the mercury survival light to their APH-5 helmets. What do you think of this practice?

WONDERMOUSE

► Placing the survival light on the helmet could result in its loss if the helmet is lost during egress. Mounting the survival light on the helmet after completing emergency egress may be of value in water survival situations. However, consideration must be given to the light's position and possible effect on the night vision of rescue personnel, particularly during helo lift.

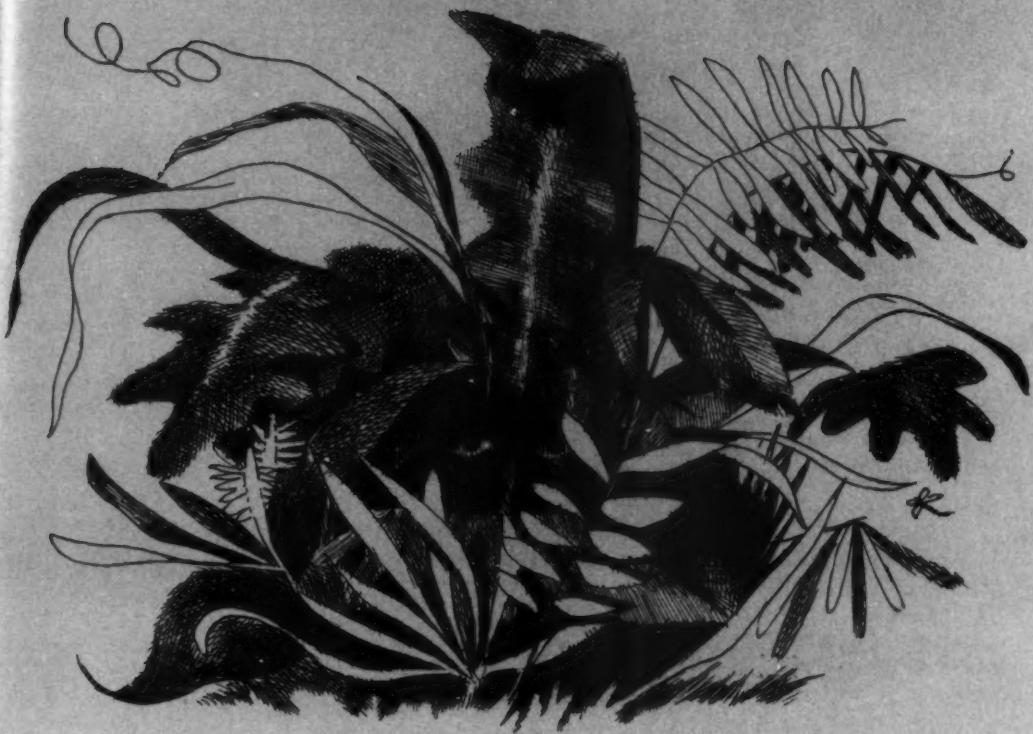
The Aerospace Crew Equipment Laboratory has an evaluation program underway regarding attaching the survival strobe light on the APH 5/6 helmet. Results will be disseminated by the Safety Center on receipt.

Very resp'y,

Headmouse







21

Every naval aviator should know the elements of

SURVIVAL IN THE TROPICS

**The material on the following pages is intended as
a review of the subject. For more detailed information,
refer to the 'Survival Training Guide,' NavWeps 00-80T-
56.**

No two survival situations are exactly alike and from the suggestions offered, you must choose the most practical ones for the particular circumstances. For example, if fast travel is most important at the moment, don't engage in time-consuming fish activity. If concealment is primary, elaborate cooking and camp-building schemes will be eliminated. Keeping body and clothes clean with soap and water is all right if you, (1) have soap, (2) have suitable water, and (3) have time. Otherwise, do the best you can. Improvise. Use imagination. Be resourceful.

The Mental Element in Survival

Among all the detailed information that has been gathered, sifted and studied from all the available case histories of survival, one point is repeatedly stressed as the most important single factor in bringing men through it all; a particular kind of mental attitude that is best described as *unyielding*. In other words, the drive to come home again is all in the way you set your mind to it.

Survival is a *state of mind*, on which your life will depend. No one is really able to predict which men in any group just naturally possess this state of mind. Survival brings out traits one never knew he had. Some men who never thought of themselves as particularly brave react with resolution, resourcefulness, and courage, emerging with new respect for themselves.

Although there are no infallible ways to test individual men, our accumulated survival experience—the actual testimony of men who have been through the toughest situations and have come back—provides a pattern for establishing in every individual the psy-

chological conditioning, the mental program of preparation and organization that in known cases has consistently brought men home in good shape.

Control and use your *mind* as an instrument to plan, to think, to remember, to imagine, to invent, to hope, to control yourself, to direct your efforts.

In outline here are nine points that will give you a basis for remembering the side of survival that goes on in *your mind*—the most important part of survival:

1. On every flight, face the possibility of having to survive.
2. Expect to have to reorganize in the face of changing situations.
3. Study your plight—optimistically.
4. Arrange for basic needs.
5. Set definite goals.
6. Cope with your fears.
7. Keep yourself busy.
8. Fit yourself to the country.
9. Don't give in to anything.

This is not oversimplification. One or all of these points will keep you alive—as they have saved other men.

The Tropics

When used with reference to survival, the term "tropics" refers primarily to jungles, for those are the parts of the tropics which present survival problems distinctly different from those in other parts of the world. Almost all heavily vegetated areas in tropical regions are called jungles.

Night in the jungle comes very fast. So prepare for bed early. In the jungle you need more sleep than usual to keep up your energy and strength and to maintain resistance against disease. Contact with the ground will chill, so don't sleep on the ground if avoidable.

In the wet jungle forest, shelter from the dampness is desirable.

In mountainous jungle, the nights are cold. Get out of the wind. A fire is best made against a log or rockpile with your shelter arranged so that you get reflected heat.

It is very desirable to have a fire in the jungle. The fire provides heat during chilly nights, serves for cooking, and helps keep away mosquitoes and curious animals. Don't make a big roaring bonfire. A small one serves the same purpose and is easier to keep up.

Most stories about the animals, snakes, spiders, and other nameless terrors of the jungle are pure bunk. You are probably safer from sudden death in the jungle due to these than in most big cities. You will probably never see a poisonous snake or a large animal. What may scare you most are the howls, screams, and crashing sounds made by noisy monkeys, birds, insects, and falling trees.

The real dangers of the tropics are the insects, many of which pass on diseases. Probably the worst is malaria, which is transmitted by the mosquito.

There are many other insects and pests in the jungle—ticks, leeches, scorpions, centipedes, and spiders, to name just a few. They can all create infection and cause illness. Check your body and your clothing frequently and get rid of them.

Beware of scratches also; in the jungle even the slightest scratch can cause serious infection within hours.

Always take good care of your clothes in the jungle. They are your protection against exposure, insects, and pests. Tuck the bottom cuffs of your flight suit into the tops of your boots or improvise puttees to keep out ticks and

Inspect your clothing thoroughly for insects or vermin.

leeches. Keep sleeves rolled down and buttoned. This also helps protect you against scratches from armed plants (thorns, brambles, and the like).

Wear full clothing, especially at night. In the morning take off your clothes, make a thorough inspection of your skin for ticks, chiggers, insects, leeches, or any other vermin that may have attached themselves to you during the night. Check your clothes, inspect them thoroughly, and get rid of any insects that may have gotten on them.

In general, loosely worn clothes will help you keep cool, for the air trapped in them makes good insulation. Dry clothing before nightfall to avoid discomfort from cold. If you have an extra change of clothes, especially socks, keep them dry to replace wet clothing. Wash clothes, especially socks, daily. Dirty clothes not only rot but may lead to skin diseases.

In open country or in high grass country, wear a neckcloth or improvised head covering for protection from sunburn or dust. Move carefully through high grass. Some types of sharp-edged grass can cut your clothing to shreds.

Concealment

In various tropical areas, it may be important not to be seen until you are certain of your situation. Here are some rules for concealment:

1. Avoid clothing which contrasts with the background.
2. Don't move when under observation.
3. Don't silhouette yourself against a light backdrop.
4. Try to keep in dark or shadowy places.

Khaki and green uniform equipment is designed to blend with most natural backgrounds. Sometimes it may be desirable to wear leafy branches around your head and shoulders. Camouflage your shelter or camp area. Hang laundry in a bush, hidden by leaves.

When you see game or persons by whom you do not wish to be seen, don't move. It is safer to stand still than to run for shelter. If you have time, drop flat on the ground, keeping head down. Experienced hunters often report that they have stood still and observed other hunters as they passed close by without being seen, in some cases even when entirely un concealed. Many hunters have almost bumped into motionless deer or rabbits before they saw them.

When moving along a ridge, remember you are silhouetted against the sky.

Try to keep in dark and shadowy places. If you build a fire at night in unfriendly territory, screen it with brush or the paulin. Have water or sand ready to extinguish it. Build shelter in the bushes or trees rather than out in a clearing, even though the job may be more difficult.

Avoid leaving a trail. In breaking camp or moving out from a resting place, remove signs that you have been there.

Primitive Land Travel

If you crash-land and unless there's a very good reason to travel, you'll be better off remaining at or near the scene. If you don't travel you need not abandon useful equipment, you don't aggravate injuries, and you have more time to search for food and water.

This does not mean, however, that you must stay within a few yards of the airplane. On the contrary, reconnoiter the area for several miles in each direction, particularly if rescue does not come in the first few days. You can avoid taking the chance of being missed by search units by doing your reconnoitering on cloudy, overcast days.

If you must leave the crash scene it may be better to move only as far as a suitable rescue location if the area is within helicopter range. If the area where you go down is too far for rescue, uninhabitable, near a safe and civilized place, or too dangerous, then travel may be indicated.

Having decided you must travel:

1. Pick an immediate, nearby objective which offers advantages of shelter or observation of the area.

2. Select the equipment you will take. Take too much rather than too little; some can be discarded later.

3. Upon reaching your immediate objective take a few minutes before moving further, if possible. Several things should be done:

- Estimate where you are.
- Decide where you will go.
- Make a pack in which to carry needed gear. Don't overload yourself, but do carry as much as you can, consistent with the situation.

In any terrain and climate, the following pieces of equipment will prove useful: matches, or lighter, candle, compass, chart, first aid kit, pencil, watch.

Other important items include a machete or stout knife, water, food, signal mirror, sunglasses,

Wear clothing that fits the situation.

pistol and ammo, a big piece of parachute cloth and some shroud-lines.

After determining your probable position and establishing the directions of the compass, you still may not be sure which direction to travel or what route to follow in a certain general direction. The seacoast has more towns than inland regions. Thus you may assume that rivers and streams lead to civilization (there are a few exceptions to this rule).

Where the terrain is flat, waterways may meander and wander so that they do not indicate the direction to civilization. In rolling or mountainous lands, the direction of waterflow in a major stream or river may be assumed to point to human habitations. In mountains, it is easier to travel along ridges which parallel the valleys.

Cloud formation may give you a clue to your location. On a windward coast, stratus or small cumulus clouds often form at the beachline. If you see an area of open sky which remains clear for a day or more when other parts of the

sky are clouded, it may indicate ocean.

Another consideration in the choice of a direction to travel will be the ease of travel. Take the course of least resistance. For concealment, however, the easiest route is not always the best.

When the weather gets bad, stop. Survival travel is successful only when done slowly enough to avoid starvation, thirst, accidents, and exposure. Bad weather not only increases the risks of accident and exposure, but may result in your getting lost.

Keep up a moderate but steady pace. Travel a set amount of time and then rest. Rest several times a day.

Take time out during the day to gather food if you reach a good place for picking fruit or plant food, for fishing, or for hunting. In fact, subsistence problems may leave only half the day free for travel.

The traveling survivor must depend upon his feet. Wear the best shoes you can. When you go flying, wear sturdy shoes well broken-

in, but in good condition.

Dry your feet as soon as possible after getting them wet. When resting, remove your shoes and exercise your feet by wiggling toes and bending your ankles.

Avoid sunburn and chapping. Keep clean. Bathe every day if the climate or water sources permit. Even a rinse in a stream or lake will do a lot for your comfort. Minor injuries, particularly blisters or abrasions of the feet, may bring a stop to travel. Cleanliness will help prevent infection.

Forested areas in the wilderness or in the jungle will offer rather a different problem from the woods near home. In addition to the big trees, you will encounter thick undergrowth. Bushes, small trees, vines, and dead vegetation will obstruct your route. In tropical regions the growth may be so heavy that the sky is obscured. In such conditions, you can only travel slowly. Avoid obstacles such as thickets and swamps. Go around fallen timber rather than trying to climb over it, in order to avoid delays and injuries. Try to find

Techniques of survival will vary with the terrain, icy mountains left, steaming jungle right.



the easiest route.

In following a stream, walk along the ridges, if any, which parallel the stream rather than struggling through the heavy growth beside the stream itself.

After you find a trail, look for signs of humans and game. It pays to move quietly and keep a sharp lookout. When you come to a clearing, the trail may become overgrown and indistinct. If this occurs, cross the clearing and work along the edges for the continuation of the trail.

In tropic areas you may have to stop during the hottest hours of midday to rest. Native peoples do this.

No man traveling on foot through wild country can escape the necessity of fording streams except in the desert. Whatever the conditions are, you must find a place to ford that is basically safe and this, in turn, necessitates careful study. If there is a commanding elevation beside the river, leave your pack in a secure spot and climb to a spot where the valley can be examined.

Look for obstacles on the opposite bank which would hinder

travel. Make certain that you will be on the side where travel is the easiest, consistent with your problem.

Before committing yourself to the water, plan what you are going to do and how you are going to do it. If you have any firearms, tie them securely to the top of the pack. Regardless of the type of pack you are carrying, make certain that you are able to extricate yourself from it quickly.

If you come upon deep streams, you may have to swim or float across. In this case never try to fight the current. Always swim or float diagonally downstream in a horizontal position to reduce the danger of being pulled under. If you are a poor swimmer, or in a weakened condition, try to use a log or some other type of flotation aid.

If you get entangled in a dense growth of aquatic vegetation, keep calm and don't thrash about. You can remove the plants as simply as clothing. Stay as near to the surface as possible and swim the breast stroke using shallow strokes. If you get tired, swim or float on your back.

Morale Requirement

Survival traveling in the tropics may be rather disappointing. Days may become weeks without your getting very far. When one is used to flying over a thousand miles of wilderness in a few hours or driving 500 miles a day, it comes as a bit of shock to travel all day and still be able to look back and see the place where you started that morning. Twenty miles per day can be maintained on foot, but only when food, water, and shelter are ready and waiting at the end of the day. If subsistence problems take a few hours out of your day, and if the terrain is not marked by trails or open terrain, five miles a day may be fine progress.

Patience and determination will be your chief allies. Initiative and caution will assist you in adapting yourself to your new environment. There may be times when you will want to give up, to quit. That is only normal. Train and practice for cross-country travel before you become a survivor. With such training and drill in your memory, the problems will be less frightening and easier to solve.

Whatever the conditions on the ground, the mental effort and will to survive are constant.

First Aid

Every flyer knows that there are certain unavoidable dangers involved in leaving a disabled airplane—whether by ditching at sea, making a forced landing, or ejection. About 60 percent of World War II pilots and crewmen sustained an injury of some kind in making the transfer from airplane to the survival situation.

While the incidence of injuries is high, injuries are not something to be needlessly feared, because many injuries are minor ones—burns, cuts, scratches; there's a lot you can do to bring about healthy recovery.

But serious injuries do occur. They must be treated quickly and as thoroughly as conditions permit. You must have not only the knowledge of how to treat yourself but also the courage and the presence of mind to treat your own injuries even when they are serious. To do this, you must be mentally prepared to act intelligently and efficiently.

If, upon landing, immediate travel is indicated, the one most important item of first aid would be to stop bleeding by any means possible. The greatest complication of wounds, infection, can be avoided if adequate cleansing is done at the time of injury. However, don't let the hydraulic system run out of fluid just because the only available compress isn't sterile and may cause infection.

If quick rescue is probable, proper treatment can be made in sick bay or at an aid station.

For a flesh wound from a rifle or pistol, simply apply a sterile (boiled) compress bandage and bind it tightly in place. If a bone is broken, splint it. If the bullet has not gone through and is deeply imbedded, leave it alone. Don't attempt to probe for it to remove

it. The chances are that it will cause no serious harm, at least for awhile.

If bits of clothing have been driven into the wound, attempt to remove them even though it involves a small amount of cutting, but do it in as sterile and clean a manner as possible.

Don't puncture a foot blister unless absolutely necessary. If the blister heals without breaking, the chances of its getting infected are greatly decreased. If you puncture the blister, however, use a sharp object that has been sterilized by boiling or flaming. If the blister becomes infected, soak it in hot, clean water, cover it with a clean dressing and eliminate the source of irritation so as to prevent the formation of future blisters.

Hygiene and Sanitation

Forethought and preparation are vitally necessary. Know the land that you will be flying over and the hazards you're most likely to encounter. By keeping your immunizations current at all times, you can avoid many serious diseases that would otherwise present a serious threat especially in a survival situation. Furthermore, it is wise to be prepared at all times with respect to proper clothing. Never start a mission without proper shoes, socks, underwear, clothes and personal equipment.

Cleanliness will do much to prevent skin and vermin infestations. Much can be accomplished by washing without soap, although soap increases the efficiency and effectiveness of the procedure. Rinsing clothes several times in plain water, for example, will clean them to a surprising extent.

Take care of the feet that may carry you home. Keep the toenails cleaned and cut. Remember to cut them straight across.

Rounding of the corners is the most frequent cause of ingrown toenails. Wear wool socks and, if possible start a mission with a fairly new pair of socks which have been washed several times. Worn socks are likely to develop holes after limited survival travel.

Your feet will be your only means of transportation. Treat them with the greatest care and respect.

You may be rescued before food becomes another part of the survival problem. However, the possibility of extended survival conditions will make food an important consideration.

You may have to eat many unusual foods. Try to eat only foods cooked at boiling temperatures and drink only water that has been either purified with halazone tablets or boiled. Any food that is questionable, but because of food scarcity must be eaten, should be thoroughly cooked before it is consumed.

As soon as you have any of the symptoms of food poisoning, drink several glasses of warm water, and then stick your finger down your throat until all the water is vomited up. Repeat this procedure two or three times. If you have diarrhea, remain quiet and drink as much water as possible without causing nausea and vomiting.

Important as cooking is, however, don't starve yourself just because you can't get a fire started or because a concealment problem dictates that you should not build a fire. Cooking is not usually necessary in order to get food energy out of edible material. In fact, animal products are more nutritious if eaten raw, or only slightly cooked.

Dysentery is an inflammation of the intestines resulting in severe abdominal pains and diarrhea, which may be bloody. It is caused

Whenever possible cook food, boil drinking water.

by contaminated food or water and can be prevented if you can cook your food or water at boiling temperatures and purify your water. Unfortunately, you may not be able to do this and may get dysentery. What can you do?

Charcoal can help. Take any partially burned piece of wood, scrape off the charred portions and swallow them—about a handful, if you can get down that much. Bones—any kind of bones—can also help. They are best if burned and ground into ash, but you can grind bones to a powder between rocks and just swallow the powder.

Bark brew also helps. Pull bark from trees (any kind will do), and boil the bark from 12 hours to three days. As the water evaporates, add more. The resulting brew will be so black, so vile tasting, and so evil smelling that it will tend to choke you. But boiled bark contains tannic acid, and that will help cure the dysentery. It can also help heal burns. For the same reason, tea helps dysentery and burns.

Scurvy is a disease caused by the deficiency of vitamin C. It can be cured by vegetables, even if this consists of only seaweed, roots bark, or wild plants. Scurvy is characterized by weakness, anemia, spongy gums, and bleeding mucous membranes.

Tropical warmth and moisture combine to favor bacterial and fungus growth. Once infection starts, tropical conditions make it hard to cure.

In addition to infections, you will have to guard against insects and pests. Ticks, leeches, scorpions, centipedes, and spiders are just a few of them. If leeches or ticks attach themselves to you, the best

way to take them off is by applying iodine or lime juice to them, digging them out with the flat of a knife, or holding a lit cigarette close to them. Then apply iodine immediately to combat infection.

Water

In all the areas of the world in which you must survive except possibly the Arctic, you will face either the problem of finding water or of purifying water.

The amount of water a man needs can vary from one pint to five gallons per day, depending on the climate, exertion, health, body weight, and the duration of the period of reduced supply. An average man, engaging in little exercise, can exist quite well except in hot climates on two quarts a day. A ration of a pint a day can be maintained only a few days without definite body dehydration and loss of efficiency.

With limited water supplies the first rule is to ration the supply. Don't drink your daily ration all at once. Drink four to eight equal quantities a day in small sips.

The second rule is to eat less. Digestive processes require water which forms urine to remove waste products. If you do not have any water, don't eat, for eating will hasten dehydration of your body. Do not eat a normal amount of food unless your water ration is two to three quarts daily. With limited water especially avoid dry foods, salty foods, and large amounts of protein and fats, fish or eggs.

The third rule is to control perspiration. In normal life, we lose a quart or more of water each day in the form of sweat. To control the amount of sweating, avoid sunlight and exertion. This may

be hard when you are trying to travel and survive. The solution is: Take it easy.

Move slowly, look over each area before entering it. You can find more food and water in most regions by not moving too fast. Along the seashore you can cut down perspiration by keeping clothing wet (or damp) with sea water.

Water Sources

Rain is pure water. If you don't like the taste, the reason is that being pure, it lacks the mineral salts of the water you're accustomed to. These salts give water its taste.

Dew is a good source of water. It is pure except for possible dirt from the surface of the leaves or other objects upon which it has collected. You will find more dew on a clear night than on an overcast night. Collect it just before dawn by holding a container under the leaves of plants and trees, and shaking off the dew. An alternative is to mop up the dew with a clean cloth or handful of soft grass. Then wring out the dew into your mouth or into a container.

Springs and seepage, especially issuing from a rock, are usually safe.

Streams and rivers can usually be presumed to be unsafe sources of water, requiring purification before drinking. Lakes and ponds usually contain less mud and sediment than streams, but they are equally questionable water sources.

There are three methods of water purification available to survivors. Purification by boiling is completely sure and does not expend supplies or emergency equipment. Boil your water from one to three minutes. If your drinking

container is of questionable cleanliness, you may wish to boil it, too, in the water to sterilize it.

The second-best method of purification is by use of the halazone or some other brand of water-purification tablets from your first-aid kit. The halazone tablets purify water by a chlorination process similar to that used in municipal water systems. A slight chlorine odor indicates that the water has been treated. Be sure to let the water stand for the required time after adding the tablets.

When you have used all your water-purification tablets, add eight drops of a 2½ percent iodine solution (from the first-aid kit) per quart of water and let the mixture stand 10 minutes before drinking. Don't use larger amounts of iodine, and if the solution on hand is stronger than 2½ percent, use proportionately less of it. In some kits the iodine may be provided in tablets for water-purification use.

If the three methods listed above cannot be used and two water containers are available, let the water stand in one so that all foreign material will settle to the bottom. Carefully pour off the clear water into the other container and then churn this clear part vigorously so that air becomes well mixed with it. Then let it stand in the sunlight for awhile, for some germs are easily killed by plenty of air and sunlight.

Shelter

The type of shelter you devise depends upon the season, terrain, vegetation, and whether you can consider yourself in friendly territory. However, don't neglect the need for shelter. It's actually important in helping you stay in good physical and mental condition and is well worth the

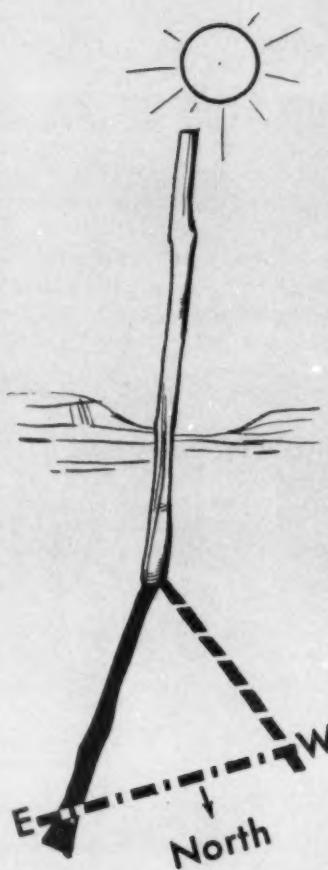
effort required to arrange it. An extra hour spent in making a good bed and shelter at night may well give you enough extra rest to save two hours of travel time the next day.

Begin to look for possible shelter sites at least two hours before sunset. Expend as little time and energy as possible on making your shelter unless you plan to stay for some time. Use natural shelters such as terraces, bushes, depressions, or large rocks to promote concealment and break the wind.

If possible do a little exploring and try to get an outline for an alternative means of egress from the shelter area; should unwelcome visitors approach the front door, provide a back door for quick, unobserved departure. Have important survival items or equipment packed and ready at hand.

Physical Condition

Keeping well and physically fit is always important, but is especially important to the man on his own in a wilderness. The person who is physically fit when he begins his survival operation is more likely to come out alive than one who is not.



DF Shadow Tip

Stick a branch at least three ft long into the ground. Mark the tip of the shadow once and then a second time about 10 minutes later. A line drawn between the two marks points east and west. The second mark is always toward the east.



For more detailed review and information see the Survival Training Guide NavWeps 00-SOT-56



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SUPersonic EJECTION

During tail chase in a scheduled tactics flight, an F-4B exploded and burned. The pilot escaped but the RIO did not survive . . .

The pilot had just checked all engine instruments for normal readings when the lead pilot called for afterburner upon entering the zero-G dive. He selected afterburner and about a minute later commenced his recovery with an approximately 2-G pullout. Suddenly he heard an airframe rumble and felt shaking in the after fuselage. Simultaneously, orange flame burst out from both sides of the fuselage. The control stick was snapped abruptly forward from his grasp. Instantly he deselected afterburner and closed both throttles to idle. Fire engulfed the entire aircraft to the area of the intake ducts and front cockpit and obscured outside vision as the uncontrollable F-4 plunged toward the sea.

The pilot ordered the RIO to eject. Seconds later he heard a sound which he thought was the RIO's seat firing. Long tongues of flame were now filling the front cockpit from behind. The pilot pulled his face curtain but it stopped slightly below eye level. *Nothing happened.* He pulled it again with no better results. Realizing that his canopy had not jettisoned, he held the curtain over his face with his right hand and reached through the flames to grasp and pull the emergency canopy jettison handle with his left. The canopy jettisoned and he pulled the face curtain and ejected.

Ejection occurred at an estimated mach 1.1 at about 15,000 ft.

The pilot describes parachute opening as "gentle." He removed his gloves, which had shrunk in the fire, released his left seat kit rocket jet fitting and inflated his Mk-3 life preserver. (*We sympathize with anyone having such an experience but ejection policy requires our noting the F-4 NATOPS which says: "In all overwater ejections, the survival kit should be left in its normal carrying position and the life raft should be released during parachute descent." This is done by pulling the kit release handle.*—Ed.)

As he neared the water there was marked oscillation. Entry shock was mild. His inflated life preserver kept him from submerging more than a few inches and the parachute collapsed in front of him. He easily released his shoulder rocket jet fittings since the chute landed downwind. Deploying his Scott

seat kit, he inflated his raft with ease before it was completely inflated and later commented that this facilitated his entry.

Once in the life raft, he removed the three or four shroud lines which were around his feet. Then he tied the parachute to the raft as a sea anchor. (*This seems inadvisable as there is a possibility that the parachute might drag the life raft under.*—Ed.) He then removed his APH-6 helmet, inspected his PK-2 equipment and deployed a packet of dye marker. The dye marker was later described as "a definite visual aid for orbiting aircraft."

A short time afterwards, a Coast Guard amphibian flew over and dropped a smoke float about 20 yards away from the raft. The survivor then saw the station helicopter approaching. He elected to be picked up from the raft rather than get back into the water, although rotor wash blew the raft around, somewhat complicating the recovery. He put his helmet back on to prevent possible injury during hoist and entry into the helicopter.

The first time the rescue sling was lowered, a line became tangled about his chin. He cast it off but not before it had scraped his chin. The next recovery attempt was successful with a smooth hoist until he reached the helo hatch. At the hatch he bumped his head several times as the crew tried to pull him in. His helmet was later described by the squadron survival equipment officer as "scorched, gouged and chafed."

The pilot sustained first- and second-degree burns on the arms, hands, forehead and right knee in the accident. A slight contusion of the left side of his chest was attributed to a possible blow from his .38 during parachute deployment. (He carries his revolver in a shoulder holster.) He also suffered mild exposure from his 15 to 20 minutes stay in 61° water. He returned to duty in 48 hours.

In remarking on the pilot's burns, the investigating flight surgeon states that "severe burns were prevented by the use of flight gloves; however, a hole in the forefinger seam of the right glove and the heat shrinkage of both gloves probably resulted in more severe burns than would have occurred had the gloves remained intact. The pilot did not have his visor down. This resulted in the burns on the right side of his forehead and singed eyebrows and eyelashes. Most of the burns occurred in areas where the flight suit charred away. The suit had not been washed and had excellent fireproofing material. The pilot's wool jersey protected his upper arms and shoulders from burns. His anti-G suit prevented burns of the lower leg."

Manhood vs. Safety

By Chaytor D. Mason, Psychologist, USC

One of the curious curses of our culture is the conclusion that anyone interested in his own safety is far too frightened to play the game well or give the job its fullest measure and therefore should be sacked on the spot.

This is a sad but realistic truth relating to Man's own appraisal of—Manhood.

When it comes to "being a man," the average proud male cannot satisfy himself with buckling his biceps, or even by looking at the handsome progeny his seed has begotten.

Some secret spark of pride also directs that, should the occasion demand, the Man will also be willing to conduct himself like an utter Boob, disregarding all precautions—expressed or implied—in the performance of almost anything that will prove he isn't a Sissy.

We lost a lot of good men that way.

And some of the characters classed as Sissies, because they have at least a small regard for their own

skins, manage handsomely to survive, live to see another day, and in the process contribute magnificently to the total goal.

This seems to be today's unsatisfactorily unsafe story of safety education—be it flight safety, highway safety, or even something as relatively minimal as household safety.

Let's flashback a few years: Baseball was born in Hoboken, N. J., in 1846. It was born a bare-handed game. The first teams played with the same hard-rock ball used today. But the baseball glove hadn't been invented. Caught with bare hands, the ball broke hands and split thumbs. Not every catch was a lucky one.

And so it went along its maiming way for 25 years until, on one sunny day, Charlie White, first baseman for Boston and tired of sore hands, came onto the field wearing a thin, but nonetheless protective glove. He never got a chance to use it. He was laughed off the field with a chorus of catcalls:



"If ya that scared of th' ball, don't play." . . .
"Catch the ball; don't MUFF it."

Gloves were not worn on an American baseball diamond for another five years. And baseball went through the same time-trials in the evolution of a catcher's mask, a chest protector and even today's hard hat.

Football, you will remember, fared no better in the development of "safety appliances." You may also recall that it has only been a few years ago when one of these bits of evidence for superior manliness was the cool defiance of a quarterback heaving his heavy helmet heavenward. Now there was a MAN who would lead the team to victory, the fans said.

No matter the game, the story has been essentially the same. You saw it in baseball, football, hockey, boxing—or that grimdest game of all—war.

Even in war the development of life-protecting headgear, garments and even practices historically has been considered a vile form of cowardice—unmanly and even unpatriotic!

Let's look at the record for a moment:

In the American Revolution, the Soldiers of his Britannic Majesty, George III, wore brilliant red coats and white pants and marched in bold, shoulder-to-shoulder formations against the sharpshooting guerillas of the day.

The Redcoats never really got the idea.

And about 140 years later the French Poilus and British Tommy Atkins were again marching off to war wearing crimson hats of cloth. Without so much as a change of uniform, they moved from the sidewalk cafes in Paris to the Front.

With little more ado, they faltered and fell before the machine guns of the Germans—who happened to have been wearing very hard hats at the time.

Resistance to hard hats and the protection they afforded was not necessarily a soldier-of-the-line idea. Despite directives from superiors, local commanders resisted trading off the bravado of the bright and soft hat for the dull steel helmet. One British commander went so far as to declare that anyone in his command who wore a hard hat would be court-martialed on the spot for "cowardice in the face of the enemy."

It was just another case of a man trying to prove that he—as well as those in his command—weren't Sissies and could firmly establish their manliness just by flaunting safety!

Come to think of it—have you ever seen a picture

of World War I's Black Jack Pershing or World War II's Douglas MacArthur wearing anything but a soft hat? What were they trying to prove?

And then there was that firebrand of the ETO—old Blood and Guts Patton. He wore his hard hat, or at least a helmet liner, all of the time. But he had to prove how tough he was by insisting that the vehicles in his command move with tops DOWN—and to Hell with whatever Old Man Weather happened to be dropping off at the time.

There are other stories and other examples and you can supply your own variations to the theme.

But the essence of it all is simply this:

We can talk about Safety as a hoped-for ideal. But we will not even go through the motions of doing things safely unless they do not disturb our own ideas of what is manly.

It also means that, unless we make some sweeping changes in our own thinking about safety and about its relationship—if any—to manliness and all the business of being a Man, we will continue to have the same old disappointing safety statistics year after year—in the air, on the highway, even in the home.

In the field of aviation safety, we can expect that the accident rate for junior flying officers will continue high because there are "manly" young men who are trying to prove themselves. But the same rates may apply for those officers in their "dangerous Forties" who are trying to re-prove their manhood all over again.

Probably we will arrive at no improvement at all, in the matter of safety until we re-evaluate "manhood." First of all, this must be a personal re-evaluation.

Is a MAN the one who runs headlong into a well-camouflaged machine gun nest knowing it means sudden death? Or is the real MAN the one who flanks the nest and throws in the destroying grenade?

Is a MAN the pilot who says "give me a plane and point me toward the target?" . . . or the one who says "a flak vest and a hard hat will help me on this mission?"

Is a MAN the one who scoffs: "I'll fly through this front or bust my butt?" . . . or the pilot who is willing to sit for a spell, wait for the ugly weather front to pass, and then gets up there to deliver the goods?

It's a strange heritage which decrees we are MEN only when we disregard caution. . . .

It will take a lot of education.

COMBINATION OF ERRORS

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The bulk of our squadron was deployed on a tactical exercise and three of us remained behind bossing the rear echelon. On the next to the last day of the problem, Roon, the O-in-C; and myself, a rear echelon maintenance honcho, were sitting around trying to finish off the coffee pot before secure time when the message arrived: Advance base needed two good planes for missions tomorrow. Ferry them down tonight.

Roon couldn't go so it was up to me and the material officer, who I will call Rawhide. Rawhide had secured for the day so Roon went to find him and help him pack our gear while I looked into getting the two planes ready.

After much activity, but little enthusiasm, we were all set. We really didn't care to get involved in the confusion of returning to home base with the advance group. The weather was poor, the winds bad, and it seemed to be raining on the whole world. However, it was the work we had signed up to do, so we leaped off in section just after dark.

The first leg showed us it wasn't going to be any picnic. We had over 200 miles with headwinds and had to zig-zag here and there to avoid thunderstorms. All of this was eating into our fuel reserves. Then all of Rawhide's exterior lights went off, except for his green wing tip light. As it turned out, this was only the beginning.

Just past . . . my yaw stab went out, leaving the rudder nearly full left. To keep the drag down I had to hold almost full right rudder. This was hard on the old leg, but gas was already just a little short.

After leaving the Southern tip of the country, we started making contrails and this gave me enough vision to be able to ease out from Rawhide's green wing tip light and relax a little. It didn't last long.

I heard and felt a thump accompanied with a fire light. After I got over the shock and realized it was the rocket pack indicator, things calmed down considerably. There was nothing in the pack to burn but I couldn't get the rocket pack back up or the light to go off. The drag from the pack was costing about 400 pounds of fuel per hour and I couldn't do anything about that, but I could eliminate the fire light—I pulled the bulbs out.

Then I noticed the little gremlins had taken another bite out of the bird. The directional and attitude gyros were playing silly little games of their own.

During this time I lost sight of Rawhide. With no gas to spare, no instruments in an unstable plane at night over bad weather is no time to be alone. He gave me his position and we switched over to approach control. I picked up Rawhide on my radar and joined up just in time to start down through the soup on a tacan approach. GCA was to pick us up when we got in range.

The weather was reported as 800 ft overcast with one mile visibility in rain. We entered the soup at 19 grand and that little old green wing light sure did look good. I turned my white fuselage light to bright and steady to cut down glare and tucked in tight for the descent.

Everything was nice, smooth, and comfortable



I was tucked in close, close enough to see the grey belly of Rawhide's bird.

until we hit the first thunderstorm. It went from pitch black to blinding lightning flashes then to what seemed like a solid sheet of water.

That little old green wing light became my whole world. Sometimes I couldn't be sure it was still there then it would come back loud and clear. I heard the radio chatter between Rawhide and approach control but I wasn't really listening; just hanging onto that little green light.

Vaguely, I became aware that radar had lost us during the approach but finally located us on the wrong side of the station and we now being vectored around for another approach. It began to look as if this was going to take all night.

We finally got straightened out on GCA downwind to maintain 1300 ft. Then I heard Rawhide acknowledge a "final approach frequency." I was perturbed and told him I wasn't about to dial in a frequency on a night like this. Approach control decided to go along with my protests and pamper us since we were the only flight airborne that night.

On base leg the turbulence stopped but it was still black and raining. We were instructed to complete landing check list when out of turn and as we rolled wings level Rawhide called "Speed brakes, out." As the brakes came out, the rain stopped. "We're home free," I thought.

It was still very dark with a complete lack of horizon but that little old wing light looked as big as a watermelon now. It even seemed to be brighter. I was tucked in close, close enough to see the grey belly of Rawhide's bird. It had a strange undulat-

ing undertone. Sort of prismatic effect in shades of grey. Something like the belly of a big grey shark in an underwater movie.

I suddenly got a strange feeling about that. There shouldn't be enough light to see the belly. I started stepping up on Rawhide without knowing exactly why. Then I saw it—it was water. The reflection of my lower white light off the waves was illuminating the belly of Rawhide's aircraft!

The words "Pull up!" were in my mouth but were spoken too late as I saw a touch of foam as the speed brakes splashed against the water. Then the bird was gone. My memory retains the impact as a big fluorescent teardrop—like one frame out of a rapidly running movie film.

I hit the burner and instinctively pulled up in a sharp left turn to keep the area in sight. The outline of the crash spot was still there but nothing else. Then I was back in the soup—alone.

During the remainder of the flight it was as if someone else was flying the plane and I was watching over his shoulder. I watched someone else put the bird through some wild gyrations trying to recover from unusual attitudes on partial panel. Some semblance of a GCA was finally managed with needle, ball and airspeed.

The landing, taxi and shutdown were done mechanically, merely following training habits. I got out of the airplane and just stood there in the rain awhile before I began thinking again. I won't attempt to make an analysis or specific recommendations. But it can happen to you.

NOTES

Loaded Chamber

WHILE loading the port gun of an A-4C, an ordnanceman cycled live rounds through the chamber by manually operating the gun charging solenoid located in the forward engine compartment. One round failed to extract and the ordnanceman cycled a second round into it. This caused the chambered round to fire by percussion. The ordnanceman was seriously injured by fragments of the exploding cartridge case discharging through the open breech of the gun.

"The ordnanceman had knowledge of the proper method of loading the 20mm. gun," the accident report states, "but he chose to employ an unsafe method in an effort to save time and to check the operation of the gun more thoroughly."

Live ammunition should be loaded into guns for firing purposes only. Test or inspection of live ammunition by fitting it into guns is prohibited, except when specifically authorized by BuWeps.

20/20 Vision

A NUMBER of causal factors produced a towing accident that damaged two aircraft. However, for the purposes of this discussion we will limit ourselves to the medical aspects.

Following the ground accident, all towing crew members were given eye examinations by the station medical department. All crew members with the exception of the port wing walker passed the eye examination satisfactorily. The results of the wing walker's examination were such that the examining flight surgeon stated that this man's eye condition could have easily been a contributing

factor to the accident.

Among the station commanding officer's recommendations was that "all station vehicle operators, equipment operators, flight crew members and ground handling personnel shall be required to undergo a complete eye examination administered by the Station Medical Department."

If a man does not have 20/20 vision, he should have glasses that afford him this.

Walk With Care

THERE has been an upsurge of personnel injuries among maintenance personnel—three injuries to flight and maintenance personnel in a 30-day period. In each instance, the man incurred injury while walking between aircraft in the hangar area. In two of the cases, personnel were reading while walking. In some cases, the attachable warning flags had not been attached to wing tips and horizontal tail tips of the F-8 aircraft. A review of 12 months shows 15 similar incidents.

The Safety Council recommended that warning flags be used at all times on aircraft undergoing maintenance in the hangar and that all hands be cautioned concerning proper safety precautions necessary when walking around aircraft.—Safety Council

Hits Log

AN A-4E pilot ejected over land and touched down in a swamp. He contacted the ground upright but was thrown backward, his head striking a log about six inches in diameter. As evidenced by deep scratches on the right back area of his APH-5 helmet,

the helmet absorbed the blow. Except for biting his tongue, the pilot was uninjured.

This is but one more case illustrating, as the investigating flight surgeon put it, "the value of wearing the protective helmet throughout the accident and rescue phase."

Marginal

IN several ditchings over the past three years, it has been discovered that crewmen were non-swimmers or very poor swimmers so that their survival possibilities were marginal. ASO's and flight surgeons are urged to check each aircrew member for this capability.

—Iwakuni Safety Council

Screw Missing

A PILOT who ejected over land from an F-4B had known for some time that a screw was missing on the visor support frame of his APH-5 helmet. He had neglected, however, to have it replaced. During parachute descent after ejection, he found that the visor had torn loose on that side. He ripped it all the way off to avoid possible injury on landing.

Investigating flight surgeon's recommendation: Crewmembers should be aware of the necessity for maintaining personal equipment in proper condition. When minor discrepancies are noted, replacement or repair should be made prior to beginning a mission.

Ejection Hazard

IN a fatal F-4B accident, it was determined that the pilot had attempted ejection by means of the secondary firing handle. (The

from your Flight Surgeon

RIO, who successfully actuated his ejection seat by means of the face curtain, survived.) The pilot's seat was in the process of firing when impact with the water occurred. Investigators stated that the pilot "would not have survived had his ejection been successful because with both elbows smashed he could not have inflated his life preserver, or released his oxygen mask or his parachute fittings." The pilot's injuries indicated that his elbows struck the canopy rails as the seat fired.

The flight surgeon reports "reconstructing this maneuver with other personnel of varying body builds illustrated that clearance of the arms in optimum position is adequate in the F-4B, but that any departure from the recommended method could easily produce such injuries, even in personnel of medium body build."

The aircraft accident board recommended that "all crews utilizing (this) seat be thoroughly familiar with hazards to arms upon improper actuation of the secondary ejection handle."

Hot Lunches

CONCERNING the requirement for flight personnel to be in the uniform of the day in the wardroom or on mess decks for meals: This (has) caused personnel to lose rest time or skip the hot meals and rely on box lunches or snacks. During continuous operations such practice could result in inadequate nutritional intake adding to fatigue problems.

In order to assure flight crews of proper nourishment during sustained operations, the type commander will be requested to re-

quire all ASW carriers to provide some method of feeding hot meals to flight personnel in flight status.

—Aviation Safety Council

Sudden Drop

WHILE pulling up at 320-340 kts in order to go into a loop maneuver a pilot of a T-28B bent over at the waist to look up through the top of the cockpit in order to "clear" the airspace above him. As he began the loop, he kept this position when suddenly he felt a drop. For a few seconds he was dazed, then felt extremely sharp pain in his lower back. He then realized that his seat had dropped to the floor of the aircraft.

The copilot took control, aborted the loop and set a straight and level course. The pilot now felt, in addition to the severe pain, numbness along with a pins and needles sensation in both legs. He was unable to move either leg. Radioing ahead for medical assistance on arrival, the copilot brought the aircraft to home field.

The pilot had sustained a vertebral compression fracture and spinal cord concussion. The fact that the aircraft had been pulling four positive G's increased the impact with which the seat hit the floor. Total estimated weight force was 800 pounds. This plus the poor position of the pilot's vertebral column caused injuries requiring an estimated six weeks' hospitalization.

Primary cause of the pilot's accident: Prior to takeoff he adjusted the seat into the full up position but he did not check to see if the seat adjusting lever had snapped into the full forward or lock position.

Mickey Mouse Tape

ONE squadron is using reflective tape on the ear pieces of noise suppressors worn by flight deck personnel. The purpose is to offer a kind of "buddy protection" during night operations and during engine turn-ups. In this way someone wandering unwittingly into a dangerous area may be noticed by someone else and warned of his impending dangerous situation.

Recommendation: Use of reflective tape on noise suppressors of topside personnel is a commendable safety action. The committee recommends that other squadrons and divisions evaluate and consider application of this practice.

Ear Plugs

35

Item: The flight surgeon indicated that during annual physicals, VF squadron line crews are showing a definite decrease in the hearing range.

Recommendation: That a sufficient number of ear plugs be ordered on a priority basis and issued to members of the VF squadrons who have duties requiring work on the jet line. In addition, the squadron maintenance officer, line supervisors and aviation safety officers should re-educate personnel on the hazards associated with the high decibel level produced by the jet engine if not properly protected. All squadron and station supervisors should continually check line operations and remove those individuals not properly protected against noise levels from the line areas until proper action is taken.

—NAResTraCom Safety Bulletin

110

MAINTENANCE GOOFS

Maintenance Errors 3rd Quarter 1965

36

Of the 110 maintenance goofs made during the third quarter of fiscal '65, the omission of a 1-cent cotter pin resulted in the costliest maintenance-error caused mishap—an F-8E valued at \$1,069,000 became a strike when the throttle linkage became disconnected in flight and the pilot ejected.

Dollar losses via the maintenance error route for the quarter amounted to \$1,317,370—the F-8 loss accounting for the biggest share of this amount. Although the number of goofs went up (110 compared to 96 the previous quarter) costs were down from \$9,121,090.

Dollar losses through the third quarter amounted to \$11,301,000. Losses for the four quarters of fiscal '64 totalled \$24.5 million compared to \$18.5 million in '63.

For an insight as to model aircraft involved see Table I. What ratings were involved and to what extent is shown in Table II, page 38.

A review of the briefs of each mishap should provide supervisors an insight as to trouble areas so that repetitions can be minimized—remember, there's profit in knowing about the mistakes of others.

Table I
DAMAGE AND COST

	A—Strike	B—Overhaul	C—Substantial	D—Minor	E—Limited	E
F-8	\$1,069,000	F-9				\$ 500
		T-28				450
		T-39				900
		H-2				3040
		H-34				820
		P-2				1820
		P-3				12,240
		S-2				1000
F-11	20,000	C-130				3700
S-2	25,000	P-3				4080
		P-5				3000
		S-2				1000
A-4	7500	A-1				450
T-34	1500	A-4				950
C-47	3500	A-4				750
A-1	4500	A-4				10,000
F-9	5000	F-4				4550
H-34	18,200	F-8				1600
P-2	6000	F-3				4000
C-117	40,800	A-3				3000
P-3	12,500	A-4				750
A-5		A-4				750
		A-4				750
		A-4				950
A-4	750	A-4				750
F-8	1600	A-4				1250
F-8	1100	A-5				450
T-28	450	F-1				1800
H-37	1140	F-4				4550
P-2	1400	F-4				4550
C-130	3700	F-8				1100
E-1	1170	F-11				800
A-1	450	P-3				4000
A-4	750	P-5				3000
F-8	1100	C-54				1200
F-8	1600	C-54				1200
F-8	1600	C-130				1200
						Total \$1,317,370



A-4C Oil scavenge return line fitting undertorqued at oil tank, allowing engine oil loss.

A-4C Use of tail pipe blanket which had been saturated with JP-5 fuel during check resulted in fire.

A-5A Improper installation of a Marmon clamp caused engine bleed air leakage.

RA-5C The engine compressor variable stator system was misrigged. Engine stall and explosion occurred when afterburner was selected.

F-4B Engine drain line to manifold B-nut under-torqued.

F-4B Alternator drive rotor tab washer improperly installed. The afterburner, radar cooling and bus tie failed in flight.

F-8E Improper throttle linkage connection. No cotter pin. Aircraft received strike damage due to loss of engine control. *See story and photo on next page.*

F-8E Mishandling of an afterburner fuel manifold tube assembly created nicks and score marks on the fitting seat, and caused a fuel leak and fire.

RF-8A The compressor rear spacer of a J-57 P4A engine was omitted during maintenance at intermediate level. The engine flamed out during landing rollout.

F-8C Intake screen handle and pin assembly was improperly installed. The screen fell forward and the pin and handle were ingested into the engine.

Continued

Varied tasks on a variety of aircraft . . .



Table II
Maintenance Errors by Rating and by Aircraft

Rating Aircraft	AD	AM	AT	AE	AO	PC*	Totals by Aircraft
A-1		2			1		3
A-3		2			1		3
A-4	2	3	1		7	5	18
A-5	2	2	1			2	7
A-6							1
F-1				1		1	2
F-4	2			3	2	2	9
F-8	4	3			1	1	9
F-9	2				1		3
F-11		1				1	2
T-1							0
T-2		1	1				2
T-28	2	1					3
T-39		2	1				2
H-2		2					2
H-3				2			2
H-34	2	2					4
S-2/C-1	1	2		1			4
P-2	2	2					4
P-3	2	4		1	2	1	10
P-5			1			1	2
C-45							0
C-54						2	2
C-117	1	1					2
C-119	1						1
C-121	2	1				1	4
C-130	3	1				1	5
C-131						1	1
E-1	2						2
E-2							0
U-16							0
T-34	1						1
H-37	1						1
C-47	1						1
Totals	32	33	2	9	14	20	110

*Plane Captain

38



MINOR PROPERTY damage occurred to the privately owned cabbage patch—but major damage was sustained by Uncle Sam's "cabbage" account, to the tune of one million plus for a destroyed F-8. Caused a missing cotter pin in the throttle linkage.

flight oil leak.

C-47 The aircraft was turned up without being properly secured. Caused D damage.

C-117 Carburetor strainer was not cleaned during routine maintenance resulting power loss in flight.

C-119 Throttle stop pin improperly installed. The left propeller went to reverse on landing.

C-121 Oil return line flare scored during installation resulted in an oil leak.

C-121 Failure to properly install and inspect the connector to the fuel injection master pump control resulted in fuel leakage. Engine secured in flight.

KC-130F Maintenance personnel failed to properly secure the aircraft for high power turn-up.

KC-130 Improper installation of a seal on the gear box oil filter caused loss of oil.

KC-130F Propeller shaft packing seal damaged during installation, resulted in inflight oil leakage.

E-1B Overtorque of holdown studs on the torque pressure plate caused loss of engine oil.

E-1B The propeller shaft extension oil seal ring was broken during reinstallation of the propeller dome. Caused slow propeller feathering.



AM

A-1J The tail wheel collapsed when the eye bolt was removed. No jack was used.

A-1H Rudder trim rod reamed too thin in wall thickness; it broke in flight.

A-3B Improper tension set on the elevator boost disconnect. An inadvertent disconnect occurred in flight.

A-3B Improper seal installation caused rudder control cylinder failure. No movement to the left.

A-4B Failure to inspect and clean work area resulted in foreign material being left in a fuel cell.

A-4E Improper use of lock wire caused the anti-G valve to stick in the on position.

A-4C Improper installation of ASC-226 caused a landing gear hang-up.

RA-5C A hydraulic B-nut was left loose during maintenance causing loss of the no. 2 system.

RA-5C Improper installation of a bleed air gasket caused the brake accumulator seal to fail.

A-6A Premature application of hydraulic power to the aircraft. The canopy closed, injuring a crewman.

F-8C Failure to install the canopy safety pin caused



... in various environments ...

inadvertent canopy jettison during maintenance.

F-8E The upper landing gear door hinge pin was not installed. The door failed in flight.

F-8E An incorrect hose landing gear actuator was installed, permitting only partial extension of nose landing gear.

TF-9J The brake master cylinder rod was scored during maintenance. Port brake failed on landing.

TF-9J Failure to install landing gear downlock after drop check. The landing gear collapsed while being towed.

Continued

F-11A Improper installation of an O-ring caused a port main landing gear failure on landing resulting in substantial damage.

T-28C A cabin heater fuel line was left loose. An engine accessory section fire resulted.

T-39D Improper positioning of the wing jack pads caused wing damage as the aircraft was raised.

UH-2B Improper installation of the directional control bell crank caused an uncontrollable turn as RPM was advanced to topping power.

UH-2A *Murphy's Law*—drag brace installed upside-down.

UH-34G Failure to install a cotter pin in the auxiliary pitch servo. On takeoff the helo nosed over on the clam shell.

UH-34D A wheel jack exploded while jacking the aircraft. Improper jacking procedures were used.

SP-2H The nose landing gear strut was deflated while the lower engine cowling was open. Cowling was crushed in the process.

SP-2H Failure to ensure aircraft clearance while servicing landing gear struts. As the nose strut was inflated the tail section struck a work stand.

P-3A Improper installation of wing air duct support caused duct chafing (4 aircraft).

S-2F Wings were folded with polly pod installation; the starboard aileron was bent.

TS-2A Improper use of aircraft jack. The jack collapsed and punctured the forward fuselage in the wheel well area.

C-117 The tail wheel was drop-checked without using wing jacks, and the main landing gear ground lock pin was put in upside down. The starboard main gear collapsed.

C-121J Airlock fasteners left unlocked on preflight; hydraulic access door opened.

KC-130F Misrigged actuating cable to the wing life raft. The raft was actuated in flight.



AE

F-1 *Murphy's Law*—Following takeoff the pilot noted excessive nose-up stick forces. Recalling five recent trim gripes on the yellow sheets he went to alternate trim and trimmed nose-down. This resulted in 12 degrees nose up instead of the normal maximum 8 degrees. The pilot prepared to eject but he could neither let go of the stick nor get his feet into the stirrups. He managed a straight-in field arrested landing.

Investigation revealed the improperly adjusted

trim bungee caused excessive nose-up trim and cross-connected wiring of the horizontal trim tab to cause opposite movement of the trim tab. Use of a rigging fixture as required by the HMI would have revealed both the reversed wiring and the maladjusted bungee.

F-4 Engine disconnect plug left loose, causing intermittent generator operation.

F-4 The electrical power connector on the A-C power control unit was not properly secured. The female threads were stripped.

F-4 Maintenance personnel left aluminum sleaving in ASA-32 amplifier causing a short circuit.

H-3 Accelerometer wires were broken by maintenance personnel. Severe vibrations resulted.

H-3 The electrician forgot to complete the job and the aircraft was launched with tail rotating beacon cover not secured. The cover went through the tail rotor.

P-3 Improper material used for wiring conduit caused a wire to break in the landing gear down circuit.

P-5 Miswiring of the CSD centrifugal switch cannon plug caused disintegration of the AC generator rotor.

S-2 The landing gear collapsed when an electrician inadvertently pulled on the landing gear selector cable.



AO

A-1 A screwdriver was used on the release lever on a Mk-51 Mod-2 bomb rack rather than pulling the release cable. Port external fuel tank separated in flight.

A-4 Failure to properly connect the A/A 37 B-3 electrical lead to the Aero 20-A rack. The rack and bombs separated from the aircraft.

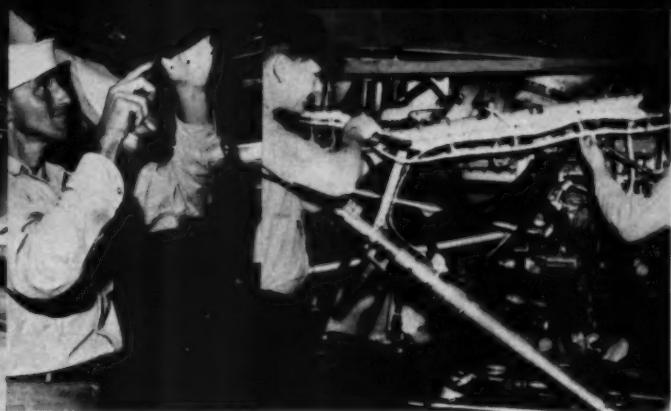
A-4 Electrical leads for PMBR not installed. The *rack and bombs* were jettisoned on the first bombing run.

A-4 Intentionally bypassing the designed safety features on the Mk 24 Mod 2A parachute flare; the flare ejected and ignited, damaging the aircraft.

A-4 Failure to remove the cartridges from the ejector bomb rack prior to testing the release circuits resulted in ejection of the center line tank.

A-4 The armament switch was bent on being struck by a foot during cockpit exit.

A-4 Failure to bypass the Aero 20A primary lead with A/A 37 B-3 adapter cable assembly caused



... call for strict adherence to SOP.

jettisoning of the rack.

A-4 Aero 20A ejector racks forward hooks were not fully locked. The fuel tank was lost in flight.

F-4 Cross-threading and stripping of a bolt during installation of a missile launcher. The launcher sagged and damaged an access door.

F-4 Failure to insure that the forward lug on the TER was fully latched while loading an Aero 7D rocket pod resulted in separation of the rocket pod during a rocket run.

F-8 LAU 35 was not properly latched on the Aero 3A launcher. The LAU 35 shifted aft and damaged the aircraft.

F-9 Failure to insure a Mk-76 practice bomb was properly loaded on the X-3B practice multiple bomb rack resulted in separation from the aircraft while taxiing.

P-3 1. Pneumatic shut-off valve incorrectly installed.
2. Improper procedures used to unload a sonobuoy.

A sonobuoy was ejected while trying to unload a sonobuoy package.

P-3 An unsecured stores launcher inspection plate came open in flight.



AT

A-4C An improperly secured retaining bolt allowed the APN-141 radar altimeter antenna wing fairing rod to fall from the aircraft in flight.

RA-5C High speed unwinding of winch due to improper seating of the drive caused ASB-12 radar package and radar antenna damage as the package was being raised after maintenance.

Plane Captain

A-3 Improper preflight. The battery access panel separated in flight. E damage.

A-4 Failure to install and properly preflight the oil tank cap. The cap and fairing separated in flight.

A-4 Failure to secure the fuselage lower access panel. The panel separated from the aircraft in flight.

A-4 Improper preflight. The cargo carrier access panel came off in flight.

A-4 The fuselage fuel cell access door was not properly secured prior to flight. It came off and struck the stabilizer.

A-4 Improper preflight. The engine access door came off in flight.

A-5 Lowered the flaps on the starboard engine forward access door.

A-5 Failure to provide adequate protection of the RAT thrust bearings during washing the aircraft.

F-1 Failure to secure and inspect an access panel. The panel was lost in flight.

F-4 The plane captain accidentally threw the tail hook up-lock safety pin into the aileron.

F-4 The drag chute failed to deploy due to improper rigging.

F-8 Improper security of a wing access panel. The panel separated shortly after takeoff.

F-11 Improper security of a hydraulic access panel. The panel tore off in flight.

P-3 A screwdriver left in the intake caused extensive compressor damage.

P-5 Failure to properly secure the engine cowling. The cowling separated in flight.

C-54 Failed to install chocks. The aircraft rolled into another aircraft.

C-54 Improper installation of a wheel caused uneven wear.

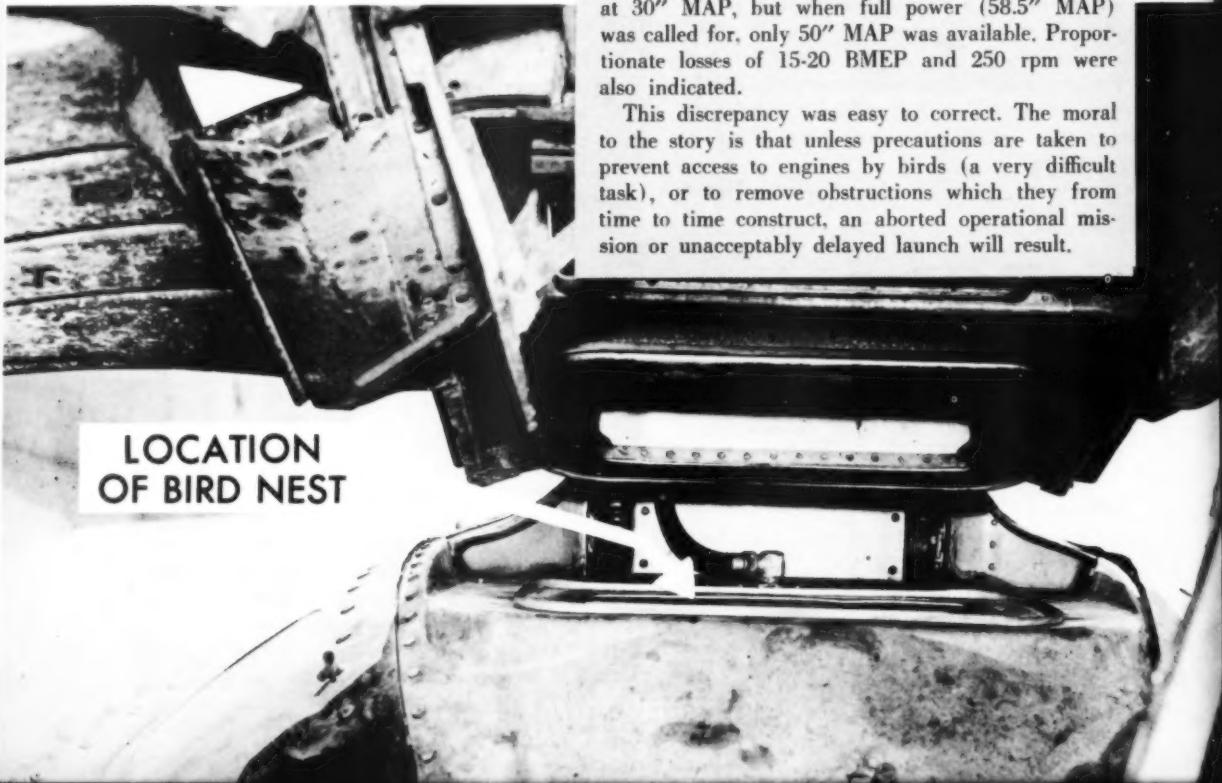
C-121 A hydraulic access panel had not been properly secured on preflight. It came off in flight.

C-130 An access panel separated from the aircraft in flight due to not being properly secured.

C-131 The aft cargo door was not properly secured. The door separated from the aircraft in flight. •

BEWARE OF THE BIRDS

Contributed by LCDR G. W. Dorn,
AEWRon Four



BIRDS are a constant source of trouble to aviators. This incident at Naval Air Facility, Lajes, Azores, demonstrates how these feathered friends can stop the largest of our flying machines.

It was early in June and the AEWRon Hurricane Hunter *Super Constellation* was scheduled for a predawn takeoff on a 15-hour weather reconnaissance mission. The crew of 24 boarded their aircraft at 0230 and proceeded to complete preparations for launch. The engine runup was normal in all respects, and the *Connie* was cleared for takeoff. BMEP was set at 150 on all four engines and the flight engineer scanned his panels. Everything normal. The pilot called for max power and the takeoff roll began. Moments later, the engineer called "Abort, engine number three!" The engine had failed to develop full power. The *Connie* was stopped and troubleshooting procedures were initiated. *No discrepancies could be detected*. The aircraft returned to the line and a visual inspection of the engine revealed that enterprising birds had selected the screen above the master control (carburetor) as an ideal spot for a nest. The entire foot-long screen had been covered with grass and straw in only one day! Other birds had begun similar operations between two cylinders on the same engine.

The resultant restricted air flow was not evident at 30" MAP, but when full power (58.5" MAP) was called for, only 50" MAP was available. Proportionate losses of 15-20 BMEP and 250 rpm were also indicated.

This discrepancy was easy to correct. The moral to the story is that unless precautions are taken to prevent access to engines by birds (a very difficult task), or to remove obstructions which they from time to time construct, an aborted operational mission or unacceptably delayed launch will result.



Ma

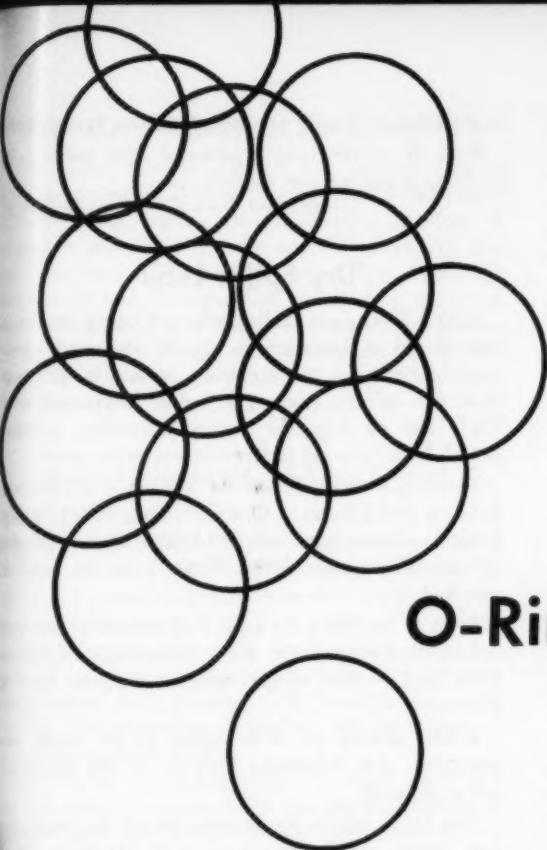
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NOTES AND COMMENTS ON MAINTENANCE

O-Ring Age Control

43

Many rubber parts appreciably deteriorate with age (storage time), eventually reaching a point where the properties of the material no longer satisfy the design requirements. There is wide variation of the age sensitivity of synthetic rubbers, depending upon the chemical composition. Also, the rate of deterioration is dependent upon environmental conditions such as exposure to sunlight, heat and ozone.

Certain synthetic rubber O-rings must be replaced after limited periods in storage. Regular inspection and replacement of rubber items is called "age control." Starting point for controlling O-ring age is the "cure date" marked on the O-ring package.

The cure date only indicates when the O-ring began its useful life. The date is shown in quarters of a year, i.e. "2Q64" indicates the second quarter of 1964 (April, May, June). All O-rings subject to age control must have a cure date. However, all items having a cure date are not necessarily subject to age control. When uninstalled, the useful life of O-rings most commonly used in aircraft equipment is 20 quarters (5 years), beginning with the cure date.

ANA (Air Force-Navy Aeronautical) Bulletin 438 establishes age control requirements for age sensitive elastomeric items prior to and at time of delivery to procuring activities. It applies to O-rings conforming to the following specifications:

Mil-P-5315	AMS 7260
Mil-P-5510	AMS 7270
Mil-P-5516	AMS 7271
Mil-R-6855	AMS 7272
(Class 1 only)	
Mil-R-7362	AMS 7274
Mil-P-25732	

Age control after delivery of an engine to the government is governed by technical orders such as the Navy publication RFI "Storage Time Limitations and Processing Codes," Section C, 0015, NavStrip Ordering No. 0533-002-5101 lists PN and storage time of synthetic rubber goods within Navy. When codes indicate that storage limits are being approached, items are taken from supply and put in expendable bins for fast usage.

A distinction must be made between an age con-

trol requirement and a requirement to mark the cure date on the package. Many drawings and specifications (such as Mil-R-25897 covering Viton parts and AMS 2817 covering O-ring (packaging) require the manufacturing date/cure date to be marked on the package. The marking of the cure date provides a basis for systematically using the oldest stock first. However, a cure-dated part is not necessarily an age controlled part.

Some series of O-rings which may or may not carry a cure date on the package do not require age control. Following are some of these series commonly used on aircraft equipment:

R1306	12006-2
R3109	19486
R1310	19546
R1312	47090-195
841B774	573431
299C414	573429
299C202, Parts 9-14	A26109
37B201207	A26110
37B201650	A26111
3CB201234, P101	A26112
37B201235, P101	S11214-5
37B201936, P101	GB2411-P112, 114, 115, 218
44 37B201714, P101, 102, 103, 104, 106, 107, 108, 110, 111, 112	37A26109-10-11-12 MS28782-3

The following series are some of the series of parts which are age controlled:

R1307	MS9021	299C202P1 thru P8
R1308	MS9241	299C202P15 & P16
AN6227	MS9355	299C410
AN6230	MS24690	299C411
AN6290	MS28775	299C412
AN123851	MS28778	299C413
thru 123950	MS29512	327B457
AN123951	MS29513	37B201714P105
thru 124050	MS29561	& P109
MS9020		

After a synthetic rubber part has been installed in a component (assembly) the age is controlled by the assembly date. The assembly date is marked on the component showing the quarter of the year that the rubber part was installed.

Shelf lives assume storage at the lowest practicable temperature and in a location that protects from air circulation and sunlight.

Plastic materials such as Teflon (tetrafluoroethylene), used in flex hoses, do not require age control.

Silicone rubber, ethylene-propylene (EPR) and

fluorocarbons (Viton) are excluded from age control.

Buna N is the only commonly used rubber in products requiring age control.

—Adapted from GE "Service News"

Dry Spline Lube

ALL J-79 engine publications are being reviewed and revised as necessary to provide the most up-to-date information on accessory spline lubrication. Most dry splines (those not being lubricated with Mil-L-7808 oil from the engine lubrication system) should be lubricated to prevent excessive wear.

Three lubricants, Plastilube Moly No. 3 (Warren Refinery and Chemical Co., Cleveland, Ohio), moly-disulfide-silicone lubricant, Mil-L-25681B, and diester molydisulfide grease, Mil-G-21164, a can be used as specified.

Prior to installing the main fuel control or the control alternator, pack the drive spline with Plastilube Moly No. 3. Either of the other two may be used as alternates.

When packing the drive spline of the main fuel pump, use only Plastilube Moly No. 3. No alternates are to be used.

The hinge bolt in the bracket slot of the rear gear box should also be lubricated with Plastilube Moly No. 3 or the alternates.

Do not lubricate any wet spline with these greases. Reactions between them and the regular engine lubricating oil may result in foaming and filter-clogging semi-solids.—GE "Jet Service News"

Fuel Meter Flow Test

USING the refueler single-point system to recirculate or dispense fuel into an open container for fuel meter flow test purposes is proving a costly practice. In two recent instances the USAF reported, death, injury and property damage attended the practice when static discharges from insufficiently grounded nozzles ignited gas vapors.

Headquarters AFLC is taking action to eliminate use of the refueler single-point system for this purpose, and to amend applicable T.O.s accordingly. In the meantime, commanders should assure that their base fueling, fire protection and ground safety activities know of the problems and establish necessary precautions to prevent additional fire losses and other damages from this hazard.—TIG Brief

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Fuel Contamination Fundamentals

DO YOU KNOW THAT—The settling rate of foreign matter in JP-type fuel is approximately one-quarter of the settling rate in aviation gasoline? A 5-micron particle will settle approximately $1\frac{1}{2}$ feet per hour in gasoline but only about four inches per hour in JP fuel. Foreign matter in JP fuel, therefore, remains in suspension longer and cannot be drained from the sumps of gas turbine aircraft, on a daily basis, as effectively as from the sumps of reciprocating aircraft.

Air Moisture vs. Engine Thrust

CONTROVERSY sometimes arises as to whether more jet engine thrust can be obtained from moist ambient air or dry ambient air. The answer can be found by comparing the molecular weight of dry air and water vapor.

According to Avogadro's hypothesis, a fixed volume of gas entering the engine inlet at a constant temperature and pressure will contain the same number of molecules regardless of the chemical composition of the gas.

Because the molecular weights of water vapor and dry air are approximately 18 and 29 respectively, it can be seen that the greater the percentage of dry air, the heavier the inlet air will be. Since thrust increases with air density, more thrust can be obtained from a given volume of airflow on a dry day than on a humid day.

A question may also arise as to why water injection on the J57 engine increases engine thrust on a warm day.

On a hot day at a given throttle setting essentially the same volume of air will enter the engine as on a cold day. However, the decreased density of the air causes a loss in weight (mass) flow through the engine. To compensate for the reduced density of the air and corresponding thrust loss, water is injected into the engine during takeoff and initial climbout.

How Important Can It Be?

JUST how much of a hazard potential is a small stray metal object?

A recent flight safety AmpFUR involving a pilot, crewman and a 6-million dollar A-6A tells a dramatic story—a kind we can do without.

While rolling left into the inverted position on a rocket run at 7300 ft, 250 kts at 80 percent power the pilot experienced a slight buffet followed

by a slow roll reversal to the right. He noted the stick was jammed full right, nose-down.

Repeated attempts to pull the stick to the left and rear while holding the trim button to the left didn't help. Rudder deflection had no effect. From the starting point of 7300 ft to 1300 ft the aircraft rolled three times in a nose-down attitude at speeds from 250 to 410 kts pulling up to 6G. While the pilot prepared to eject, the stick became free at 1300 ft. He regained control of the aircraft and returned to the field making a normal landing.

On the ground the controls operated normally. Investigation revealed an aluminum spacer $5/32$ " in diameter and $1/4$ " long lodged between the control stick bell crank assembly and control stick bracket assembly.

The potentials in this mishap are numerous—you sum them up. What's the moral? If you drop something into the innards of an aircraft—please retrieve it—immediately!

Lightning Jolt

DURING preflight, when a light rain preceding thundershowers commenced, two line crewmen took refuge under the wings of an F-8. Each crouched near a main gear wheel. The pilot in the cockpit closed his canopy. Seconds later, a bolt of lightning struck the antenna on the aircraft's tail. Both of the line crewmen were knocked down but the pilot in the cockpit felt nothing. Medical examination of the crewmen revealed no injuries. Damage to the antenna necessitated replacement.

While no recommendations were made by the reporting activity, it may be a good idea to remember that an aircraft, much like a tree, will attract lightning and therefore should not be considered safe shelter during thunderstorms.

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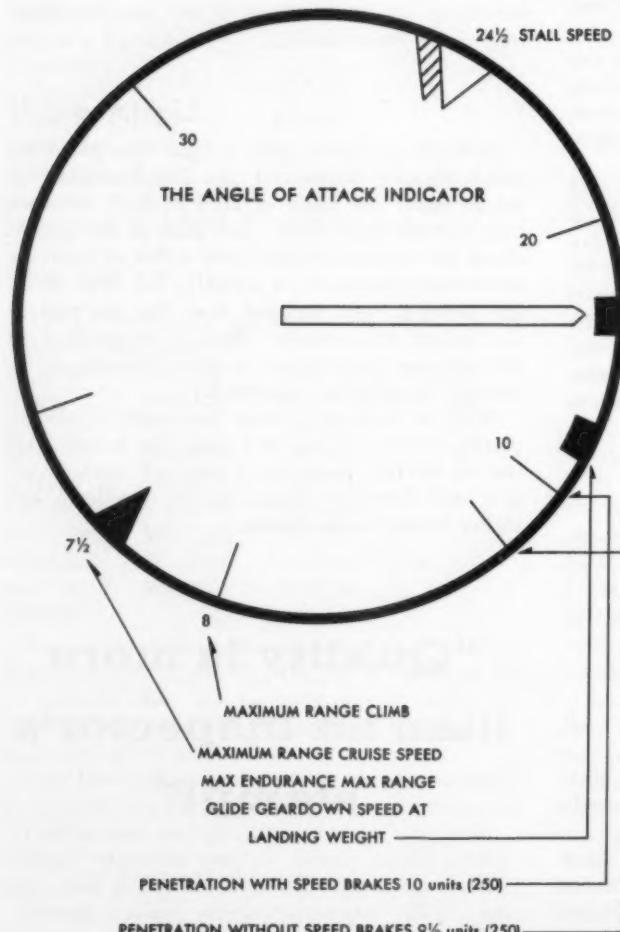
**"Quality is more
than an inspector's
stamp!"**

Letters

"While we daily deal in safety-of-flight items and religiously ground aircraft until the discrepancies are corrected, there is no such program for equally important safety items involving our flight deck equipment. Perhaps the time has come for us to institute such a program."

From an AAR endorsement

46



Angle of Attack Indicator

FPO, New York—A kneeboard card depicting the angle of attack indexer will provide all of the useful values and may be easily made using the given indices and experimentally determining other values such as penetration speeds. Such a card is extremely useful in case of pitot static failure under instrument conditions.

F. M. HAMMOND, LT.
ASO VA-34

• The Safety Center A-4 analyst suggests that the card be slightly refined, including more phases of flight, and submitted as a change to NATOPS. An F-4 crash might have been averted had the pilot had a similar card along.

The Flight Deck Chief

NavAirLant—Congratulations to Master CPO George Lechak on his excellent article concerning the Flight Deck Chief in the July issue. I was privileged to be shipmates with this outstanding Chief Petty Officer on the flight deck of *ANTETAM* years ago. His description of Admiral Marc Mitscher relaxing when spotting his Flight Deck Chief was very thought-provoking.

One unsolicited word of advice to Carrier Skippers and Air Bosses: If you don't get that same feeling of relaxed confidence upon seeing your Flight Deck Chief on deck, better make a change because you are most likely on the verge of deep trouble.

V. J. LEMMON, LCDR
(EX-FLIGHT DECK CHIEF)
STAFF, COMNAVAIRLANT

Survival Knife Pocket

FPO, New York—The survival knife pocket on aviator's flight suits is presently made at local parachute lofts and sewn on by the squadron parachute riggers. The pockets are non-standard. Some have zippers, others snaps. The pocket material also varies from squadron to squadron.

I do recognize that it would not be appropriate to have the survival knife pocket already sewn on when the flight suit is issued. Various types of aircraft may require a different location for the pocket in the interest of cockpit safety. Also, where several locations of the pocket are permissible, the individual aviator would not have any selection in the positioning of the pocket. However, I do have a recommendation: Introduce into the aviation equipment system a standard survival knife pocket which would be issued as a separate flight gear item.

This separately-issued survival knife pocket would have the following advantages: It would be a standard item. It could be sewn on the flight suit in any position which is consistent with squadron policy and individual preference. It would relieve the squadron parachute riggers of the job of locally manufacturing these pockets.

It seems like a separately-issued, standard survival knife pocket would be a very beneficial flight gear item for naval aviation.

CDR DONALD J. DE BAETS
CO, VRC-40

• A separately-issued, standard survival knife pocket would certainly relieve parachute riggers of some extra work but the consensus of opinion here is that you would find as little agreement on pocket fastenings as you do now on pocket positions. No doubt some per-

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: **APPROACH** Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

sons would want one snap, others two, and still others, hook and pile. Perhaps a basic pocket without any fastenings would be the answer; in this way, squadron riggers could add the fastenings their pilots and crewmen want.

Bandolier Fix

FPO, New York—This command has uncovered a potentially unsafe practice which we would like to share with others through the letters forum. Several bullets from the .38 caliber survival pistol have been lost in the squadron area and one was found beneath an ejection seat. If the seat had been fully lowered, the possibility exists that the bullet could have gone off.

This situation was easily remedied by sewing a piece of Mk 4 anti-exposure suit material to the back of the bandolier so as to wrap firmly around the bullets and snap in front. Since the .38 caliber pistol will probably not be replaced by the pencil flare gun in all areas, other commands might give this "fix" consideration.

D. T. PITTS, LCDR
ASO, VC-8

• Your idea for safetying the .38 caliber ammunition bandolier seems excellent. Assuming you are talking specifically about the F-8 ejection seat, our escape systems

people here say that the completely lowered seat would not touch a bullet lying on its side. If the bullet were standing on end, the lowered seat would touch it. However, the big danger is that a loose bullet constitutes a foreign object in the cockpit and as such could foul up the ejection seat linkage and control system.

Nightmanship

Edwards AFB—It seems to me that many of the runway accidents could have been avoided if taxi lights had been used. Admittedly, landing and taxi lights have no place on an aircraft carrier; but on the beach, with the possible exception of the FMLP training, their use would probably prevent or at least reduce rollout and taxi accidents.

During rollout a taxi light is invaluable, not only to show you what's ahead, but to make sure that you're seen by anyone astern. Your policy of not using taxi and landing lights has long been a source of bewilderment to me. Could you shed some light on this practice?

We read your fine magazine with much interest here at the Air Force Flight Test Center.

J. R. GENTRY, CAPT, USAF
FIGHT TEST OFFICER
AEROSPACE RESEARCH

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• Navy multi-types use the landing and taxi lights during night operations.

Although carrier aircraft have taxi lights installed, most pilots use them only if confusion exists in the taxi area. Why aren't they used for landing? It's a matter of training.

First, with the mirror or lens installed next to the runway a carrier pilot prefers to use it rather than his lights for a landing aid.

Second, the operating environment at sea on a dark night is such that the carrier pilot must operate with no references other than those on his ship.

For this reason, he purposely avoids using landing or taxi lights ashore to keep from building up a degree of dependence on them.

Your suggestion to use taxi lights during rollout could prove to be a cure for some night rollout and turnoff problems—provided it doesn't create a distraction hazard.

The idea has been forwarded for consideration and possible inclusion in NATOPS for carrier aircraft.

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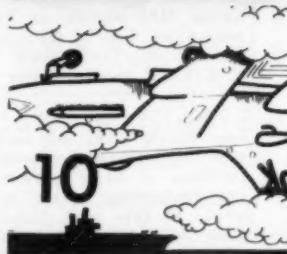
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